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AVIATION

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THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

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Edward P. Warner, Editor
ON LEAVE OF ABSENCE

Leslie E. Neville, *Managing Editor* · S. Paul Johnston, *Associate Editor* · Daniel Sayre, *Assistant Editor* · David J. Leink, *Art Director* · Paul Wooton, *Washington*

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A Record-Breaking Year for WRIGHT CYCLONES

ASTOUNDING success was achieved during 1934 by Wright Cyclone Engines. After exhaustive competitive tests, they were selected to power many advanced designs of U. S. Army and U. S. Navy military aircraft—and the majority of the latest types of high-speed commercial and air mail transports.

Wright Cyclone Engines now power practically 100% of all the high-speed passenger and air mail transports in operation on American Airlines, Eastern Air Lines, General Air Lines and Transcontinental & Western Air.

Equally impressive progress was made in foreign fields where Cyclones power the latest equipment of the Pan American Airways System, K.L.M. (Royal Dutch Airlines)—longest airline in the world—and Swissair.

Many new world records for speed and endurance were also established during 1934 by Cyclone-powered aircraft. The outstanding achievements of military and commercial planes that established these records are a tribute to the quality, construction and reliable performance of Wright Cyclone Engines in operation throughout the world

Famous WRIGHT CYCLONE *Flights of 1934*

The U. S. Navy's non-stop mass formation flight of 2408 miles, from San Francisco to Honolulu.
(6 Consolidated Navy Patrol Boats, each powered by 2 Wright Cyclones)

The U. S. Army's Alaskan flight of 7335 miles.
(11 Martin B 10 Bombers, each powered by 2 Wright Cyclones)

American Airlines speed flight from Chicago to New York in 2 hours and 59 minutes.
(Vultee V1-A Transport, powered by a Wright Cyclone)

Eastern Air Lines transcontinental flight from Los Angeles to New York in 12 hours and 3 minutes.
(Douglas 14-passenger Airliner, powered by 2 Wright Cyclones)

TWA Air Mail flight of 2875 miles from Los Angeles to New York in 11 hours and 31 minutes.
(Northrop Gamma powered by a Wright Cyclone)

K.L.M. (Royal Dutch Airlines) flight in the race from London to Melbourne—half-way around the world—in 90 hours.
(Douglas Airliner powered by 2 Wright Cyclones)

Admiral Byrd's flights in the South Polar Regions.
(Curtiss-Wright Condor powered by 2 Wright Cyclones)

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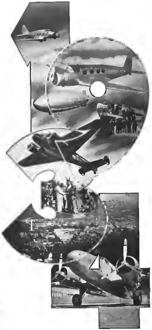
Backward Glances

A paradox—the worst, and at the same time, the most promising year in the history of American aviation.



CERTAIN years are forever earmarked by their outstanding events. Thus '88 always remains the year of the Great Blizzard, or '94 the year Cy Perkins' red barn burned. Few observers last spring doubted that there would be any trouble in finding a label for 1934, aeronautically speaking. For those who sat dazedly about in airline shops and offices, on the morning of Feb. 10, punch-drunk, shaking their heads sadly and mumbling into their beards, there was no doubt that 1934 was the year of the Great Confusion, if not the actual End of the World, with that greatest of all Postmaster Generals since Benjamin Franklin in the rôle of the Angel Gabriel.

Had things stopped at that point, black-bordered announcement cards would certainly have been in order, and the obituaries of many an aeronautical enterprise would long since have been written. Looking back over the year as it ends, however, it is difficult to find a single label to characterize it, and certainly none is justified that smacks too much of pessimism and defeat.

True, affairs in many quarters are still in an appalling mess. Financially speaking, 1934 has set new lows for most of the airlines. Payments due for the carriage of mails for the period just prior to the cancellation are still withheld. Many a line, to protect its interest in territories which it had developed at great expense, bid in on the temporary contracts at ridiculously low figures, figures that have no conceivable relationship to actual operating costs. Expensive and complicated reorganization of financial structures are now in process, forced by existing law. Men of outstanding ability who have given unreservedly of their time and energy to build up the industry, find themselves under unjust suspicions, debarred from their chosen profession without redress. On the production side, Army and


JANUARY. Navy flies to Hawaii.


FEBRUARY. Post-cancellation records.


MARCH. Army flies the mail.


APRIL. Brazilian Clipper test flown.


MAY. Air Sleeper service.


JUNE. Collier Trophy award.

Navy purchasing has been seriously hampered by lack of funds and by long and windy arguments over procurement. An excessively enthusiastic munitions investigation is making difficulties for the manufacturer who has built up his export market in the teeth of bitter foreign competition. At home, thanks to a long-drawn-out business depression, people generally have insufficient funds to support an adequate private owner market. Many an airport operator or flying school proprietor has had to reduce his activities almost to (and sometimes beyond) the vanishing point.

BUT—

No air transport year can be over-shadowed by a mere cancellation of mail contracts in which—passenger figures have mounted steadily despite early spring losses to close to the 500,000 mark; air express has made continuous and rapid progress, exceeding last year's figures by some 60 per cent regular transcontinental schedules have been reduced to a sixteen-eighteen-hour basis, with overnight services from coast to coast—special cross-continent flights have been made in regular transport equipment in a few minutes over twelve hours; regular sleeping plane services have been introduced, using equipment which compares favorably with the best Pullman tradition; standards of passenger comfort and cabin quiet at 200 m.p.h cruising speed have been attained that were undreamed-of two or three years ago, new standards of operation and maintenance technique have been adopted leading toward new safety levels, new developments in instruments and radio point definitely to the solution of blind flying and blind landing problems; a new technique for economical cruising at high altitudes was developed and put into practice.

No period could be anything but notable from the standpoint of design progress in which—transport ships like the Douglas DC2, the Boeing 247-D, Lockheed's Electra, the high speed Curtiss-Wright Condor, Vultee's transport, Stinson's new tri motor were produced in quantity and put into scheduled services to change the whole aspect of American air transport in a period of a few months, the huge Sikorsky and Martin flying boats were built broke records, and set new standards for long-range, over water transport, opening the door of tomorrow's conquest of the Atlantic and the Pacific; engines were called upon to give so much and met the demands so successfully by continuous improvement of older types and the commercial application of the newer twin-row models by both Wright and Pratt & Whitney, automatic propeller pitch control was successfully applied by both Hamilton Standard and Eclipse—such items of equipment as Sperry's automatic pilots and Goodrich de-icing overshoes were accepted as practical solutions to particular hazards.

No manufacturer's year could have been considered a total loss that witnessed the inauguration of a re-equipment program for both the Army and the Navy and the ordering of some 530 airplanes of new and improved types, including the largest single peace-time contract ever placed; an export demand second to none in aeronautical history save for the period of the War; a discernible increase in the demand for airplanes for the private owner; an active interest on the part of the Department of Commerce (backed up by an appropriation of $100,000 to promote and develop a simple and economical airplane for the private owner of to-morrow.

Finally, no more hopeful sign could be in evidence of the intent of the administration to further the interests of the aeronautical industry in America than the appointment of a Federal Aviation Commission empowered to make a complete survey of the industry and to lay down a complete and coordinated policy of development for the military, the manufacturer, and the operator.

By and large, the credits for the year outweigh the debits. The dismal beating of the tom-toms has almost disappeared in the rush of new wings and the roar of new engines as the American aviation industry reaches out for new altitude records.

Gentlemen, we give you 1934, the year in which the crack of doom proved to be only a starting gun.

JANUARY

Black Committee sets to work on air mail contracts . . . House Military Affairs Committee begins investigating military aviation . . . Six Consolidated flying boats of Patrol Squadron 10-F fly from San Diego to Hawaii in 24 hours 56 minutes . . . Industry Committee studies Vidal's $700 airplane project . . . CWA airport program inaugurated under direction of D. of C. . . . France and Germany compete on South Atlantic air routes . . . Imperial Airways plans route extension to Australia.

FEBRUARY

Air mail investigation climaxed by cancellation of all contracts effective Feb. 19 . . . Washington flooded by protests from airline officials, private citizens, without avail . . . Army takes over carrying of air mail runs into bad weather, struggles with inadequate mail equipment, loses a number of ships and pilots . . . Airlines carry on without mail contracts on reduced schedules . . . Washington flooded with legislative proposals for future of aviation . . . Army, Navy investigators wade through reams of testimony . . . reprocurement, organization, manufacturers' profits, etc., etc., etc. . . . TWA carries last commercial mail across country in 13 hours 4 minutes for new transport record . . . Army, Navy embark on modernization program for air services . . . General Staff submits plan for G H Q air force . . . Fokker acquires foreign manufacturing rights for Douglas transport . . .

MARCH

Fatalities among Army's mail pilots cause curtailment of services, reorganization, congressional investigation . . . Drum Committee looks into Air Corps efficiency . . . Army pilots get delayed back pay, increased insurance benefits . . . Black-McKellar Bill for reconstruction of air mail under fire . . . Temporary mail contracts prepared and submitted for bids . . . Airlines carry cancellation case to court to attempt to enjoin enforcement . . . Assistant Secretary of War Woodring defends competitive bidding for Air Corps equipment before House Committee . . . House Naval Committee under Delaney dismisses charges of profiteering against manufacturers of naval aircraft and equipment . . . Competitive versus negotiated contracts debated . . . U.S. and foreign military aviation budgets show upward trend . . . Control of air mail and transport by I.C.C. recommended . . . American Airlines embark on $2,000,000 re-equipment program . . . Independent operators organize.

APRIL

New specifications for 21 mail routes advertised for bids . . . Airlines reorganize to become eligible to bid for temporary contracts . . . Army has twentieth casualty in mail operations . . . Black Committee suspends hearings . . . President recommends commission for development of air policies . . . Two lines press court action against cancellation . . . Baker Board begins investigation of Air Corps . . . Germany's budget for aviation defense and commercial development shows marked increase . . . First transcontinental schedule inaugurated with Douglas planes . . . MacRobertson England-to-Australia race rules clarified . . . Department of Commerce eases requirements for private pilot licenses . . . Italy sets new world altitude record.

MAY

Army surrenders the mail as the first of the temporary commercial contracts are let . . . As final gesture, Army pilots fly mail across continent in 14 hours 8 minutes . . . Jack Frye of TWA delivers first commercial transcontinental mail under new contracts in 11 hours 31 minutes . . . Congress continues debate on industry's future and authorizes appointment of a policy-forming Federal Aviation Commission . . . Army initiates new three-year procurement program . . . Woodring versus Foulois on procurement . . . Labor Board announces decision on pilot's pay . . . D. of C. announces light plane competition . . . Sikorsky S-42 takes two FAI records.

JUNE

Last of temporary mail contracts awarded . . . President signs modified Black-McKellar Bill . . . D. of C. announces new airways installation program, more fields more radio . . . Airline suits to void cancellation dismissed . . . Air Commerce Act amended to authorize complete investigation, full publicity, in airline accident cases . . . Airlines announce expanded schedules . . . North American Aviation reorganizes to conform with law . . . Navy gets PWA funds for new planes, new plants . . . U.S.S. Ranger commissioned . . . Air Corps procurement investigation continues in a welter of contradictory testimony . . . Baker Board holds hearings . . . Collier Trophy awarded to Hamilton Standard for controllable pitch propeller . . . Time limit for D. of C. light plane bids extended . . . MacRobertson race entries announced.

JULY

Baker Board reports, recommending increases in Air Corps, establishment of G H Q force . . . Foulois asks for 1,000 new planes . . . Army and Navy make mass flights to Alaska . . . President appoints Federal Aviation Commission . . . TWA inaugurates overnight coast-to-coast service . . . S-42 takes eight more FAI records . . . Fifth annual soaring meet at Elmira . . . Membership of Air Transport Code Authority announced . . . Martin gets contract for 81 high speed bombers . . . I.C.C. begins investigation of air mail rates.

AUGUST

Airline operators and D. of C. agree on new safety rules . . . I.C.C. collects data on air mail costs . . . United Aircraft & Transport Corporation reorganizes . . . General Air Lines announces re-equipment program . . . D. of C. light plane bids opened . . . National Air Races run in Cleveland . . . Nye Committee begins investigation of munitions sales.

SEPTEMBER

Federal Aviation Commission hearings get under way . . . Navy approves new 500 plane construction program . . . Airlines report general traffic improvement . . . Air mail contract awarded for Hawaii . . . TWA carries anti-cancellation fight to Supreme Court . . . Domestic air mail schedules expanded . . . Airlines announce more re-equipment programs.

OCTOBER

F.A.C. hearings continue . . . Army carries out more Baker Board recommendations, including establishment of G H Q force . . . Hammond gets D. of C. light plane award . . . FAI delegates meet in Washington . . . Airlines announce faster schedules . . . TWA suit denied by Supreme Court . . . New world's speed record of 440 m.p.h. set in Italy . . . British de Havilland Comet first to reach Melbourne in MacRobertson race, followed closely by K.L.M. Douglas and Turner's Boeing.

NOVEMBER

F.A.C. winds up hearings . . . Navy asks for new dirigible . . . Airlines consider move of eastern terminal to Floyd Bennett Airport . . . Eastern Airlines' Douglas sets new transcontinental record at 12 hours 3 minutes . . . Kingsford-Smith flies Pacific from Australia to California . . . U.S. wingless autogiros appear.

DECEMBER

TAT, WAE, GAC liquidated to conform with law . . . F.A.C. preparing final report . . . Mail schedules again expanded . . . Army orders 110 Northrop attack, 50 Consolidated pursuit, 71 Douglas observation planes . . . PAA orders four new Sikorsky S-42s . . . Martin's huge flying boat launched . . . Imperial Airways opens route to Australia.


JULY. Army-Navy Alaskan flights.


AUGUST. National Air Races.


SEPTEMBER. F.A.C. begins hearings.

OCTOBER. MacRobertson race.

NOVEMBER. Pacific reconquered.

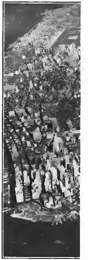

DECEMBER.

Next Stop, Wall Street!

New York has worked out a practical solution to the problem of landing passengers in the heart of the city.

By Stanley W. Jacques
General Manager, New York and Suburban Airlines

FOR a number of years there has been considerable interest in the establishment of terminals for seaplanes and flying boats in the waters around Manhattan Island. The practicability of such use had long been settled, for between 1920 and 1930 the Loening company had tested and delivered hundreds of water aircraft from its factory ramp at 31st Street on the East River—and several dyed-in-the-wool air commuters such as Juan Trippe and Richard Hoyt had made regular use of the East River in their private planes during 1932 and 1933. Proper facilities for docking were lacking, however, until the city administration became interested in providing not only for the private flyers' needs but also for the simplification of the transfer of passengers from the city to the outlying airports used by the scheduled airlines. This work, sponsored by air-minded Mayor LaGuardia, has been under the supervision of Deputy Aviation Commissioner F. W. Zelcer.



Above: Air Travelers may now be landed at Manhattan's doorstep. East River seaplane terminal facilities located at Wall Street Skyport (lower circle) and 31st Street Skyport (upper circle) are within a few minutes of any point in the financial or midtown districts

Left: Close up of the Wall Street seaplane base in operation. Eight or ten planes can be parked at the left without interfering with the use of the floating ramp by transports.

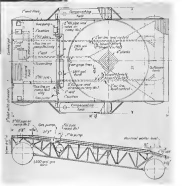
On page 5: The float deck may be inclined to receive seaplanes and quickly restored to horizontal position. Only 25 seconds is required to turn a large plane completely around, using the electric turntable

Photo by McLaughlin Aerial Surveys

Preliminary plans for modern seaplane bases, prepared by United Dry Docks, Inc., were donated to the city and construction of two bases got under way in March 1934 under the direction of C. Keith Pevear, marine consulting engineer, through an allotment of PWA funds. The original detail specifications were somewhat modified but essential features were retained. The first of these terminals was completed and put into service on September 5, 1934, at Wall Street and the East River, the second some three months later at 31st Street.

In addition to the several private planes using the facilities, New York and Suburban Airlines, Inc. carried on a daily commuting service to points on the north shore of Long Island, daily sight seeing flights over New York and a week-end charter service to Cape Cod during the 1934 season. A Bellanca Airbus on pontoons was used for these services and demonstrated that large seaplanes as well as light planes may be successfully operated in the river.

River traffic, the combined effect of current and wind, driftwood, and ice are the principal considerations affecting operation. It has been the writer's experience that no matter how congested the area may be there are always several available places for landing and taking off. From a point in front of Wall Street, it is 4,200 ft. to Governors Island in a southwesterly direction and 2,500 ft. to Brooklyn Bridge in a northeasterly direction. The river is 3,600 ft. wide at Governors Island, 1,800 ft. wide at Wall Street and 1,300 ft. wide at Brooklyn Bridge. Thus, an area of more than 100 acres with runways over 6,000 ft. long is available. Governors Island has no structures over 100 ft. high and is flanked on the north and south by wide areas of open water, which are suitable for take-off and landing areas. The Brooklyn Bridge is 135 ft. above the water and spans 1,300 ft. so there is ample room for a plane of 100 ft. wing spread and an overall height of 15 ft. to pass under in perfect safety. At 31st Street the



available take-off area is even greater as the river at this point is 3,000 ft wide and the distance to the Queensboro Bridge is 7,400 ft., while in the opposite direction the Williamsburg Bridge is 9,000 ft. away The wind and tide conditions are readily diagnosed by the experienced pilot and present no great difficulty Driftwood is for the most part composed of small debris, and the larger pieces can easily be seen and avoided During a very short period in mid-winter, floating ice cakes may present a hazard, but except for the unusual winter of 1934 there have been few occasions in the past ten years when they would have interfered with operations

The Wall Street base

The Wall Street site was selected because it is within five minutes' walk of the financial district and because general operating conditions are far more satisfactory in the East River than in the Hudson. The New York City Department of Docks (under which aviation activities function) set aside the slip between Piers 11 and 12, 156 ft. wide and 548 ft. long, for the exclusive use of seaplanes This slip is so well shielded by piers to the north and south and buildings to the west, that no matter how strong the wind blows there is never more than a light breeze to contend with in the slip, and the effect of current from a point 50 ft from the outer end of the piers is negligible

To provide parking and auxiliary landing facilities for small seaplanes and amphibians a series of ten floats six feet wide and 30 ft. long forming a sort of floating catwalk 300 ft long were placed alongside Pier 11.

The main landing terminal is in reality a large float which can be trimmed so that its deck is horizontal or inclined so as to present a sloping ramp to seaplanes It is placed lengthwise in the slip, its inboard end connected to the sea wall by means of heavy hinged steel struts and two steel gangways Its overall length is 88 ft 7 in., width 59 ft and depth 15 ft. 6 in. Gross weight 168 tons In its construction, which is 90 per cent steel, five main trusses run lengthwise between two large cylindrical steel tanks or pontoons which provide the flotation Intercostal trusses and cross braces are welded to the main trusses, forming an extremely rigid unit The entire deck, approximately 4,500 sq.ft., is surfaced with 4 in. x 10 in creosoted planking

The principle feature of the floating ramp is the electrically operated turntable, 45 ft. in diameter and so located on the ramp as to be half under water when the float is submerged to a slope of 8½ to 1. The turntable weighs 26 tons and rides on a series of 100 rollers arrangrd in concentric circles to distribute the weight. It is driven from the machine room by a ⅞-in. steel cable wrapped 1½ times around its periphery This type of drive was chosen rather than the more positive gear drive because it was feared that driftwood getting between the gear teeth would jam the gears Some trouble was experienced due to slippage but a change in the method of supporting rolls is expected to eliminate further difficulty The time required to turn the table through 180 deg. is approximately 25 seconds.

The two large pontoons placed horizontally across the float are so constructed that they provide the means by which the surface is inclined to any desired angle up to an 8½ to 1 slope The outboard pontoon, 11 ft in diameter by 45 ft. long, is divided into four compartments The two end compartments are open at the bottom like a diving bell, are airtight, and are piped to a compressed air tank. When it is desired to submerge the outer end of the float, valves are opened allowing air to escape and the compartments become flooded. When the desired slope is attained a set of automatic flotation tanks close the valves To raise the outer end of the float, compressed air is blown into the flooded compartments, forcing the water out through the bottom. Only a very little pressure (but 2 or 3 lb above atmosphere) is required to force the water out, though the volume of air required is considerable.

The inboard pontoon is 12 ft. in diameter by 45 ft long and is divided into three compartments The two outer compartments may be flooded at will by the operator as in the case of the outboard pontoon, but are much smaller and less effective; therefore they are used mainly for trimming the inboard end of the float to a desired permanent position and simplify the shifting of ballast as loading of the float is changed from time to time The center compartment of this pontoon forms a machine room 28 ft. long, reached by ladder through a trap door in the deck of the float It houses a 5 hp motor-driven air compressor having a capacity of 25 cu ft per minute at 50 lb. pressure, a 10-hp. motor-driven turning gear for turntable, and a 5 hp motor-driven winch

A work bench is provided, the room is well lighted and there is ample space for the installation of small lathes, drill presses, etc

Float controls

Control switches for the turntable and winch mechanism, also compressed air valves for raising and lowering the float are placed in a control pit near the left inboard corner of the deck From this point of vantage the operator can observe the movement of planes coming and going and adjust the position of the float or operate machinery as required The time required to raise the outboard end of the float to a horizontal position is less than 2 minutes

Along each outside longitudinal truss and below deck is located a cylindrical steel tank approximately 28 ft. long and 5 ft. in diameter. These are called compensating tanks and have the effect of sponsons in balancing the float laterally when the outboard end is submerged They also provide flotation if for any reason either end of the float should sink beyond a desired point, and are the storage tanks for the compressed air used in raising and lowering the float, having a combined capacity of 1,320 cu ft

Two fuel tanks of 1,500 and 1,000 gal capacity respectively are located below deck inboard of the turntable Electrically driven pumps of 25 gal. per minute capacity are provided for fueling planes or boats from these tanks Hoses and pumping machinery are in pits below deck. The platform is entirely unobstructed, for the handling of aircraft.

From the foregoing it is seen that all operating mechanism is below the deck of the float, resulting, as it properly should, in an unobstructed area.

Turntable etiquette

This type of floating ramp is especially advantageous for the handling of large seaplanes Pilots steer for the center of the turntable and hit the incline with sufficient momentum and power to drive the plane up the incline well onto the turntable The outboard end of the float is then raised about two feet and at the same time the turntable is swung through 180 deg so the plane is headed out and the cabin entrance is high and dry A platform is moved to the entrance and passengers may disembark as easily as from a land plane. With this type of float no more time is required from the time plane touches the water till passengers are landed than is consumed by a transport plane at the airport

At Wall Street officials of New York City have provided an attractive bungalow type waiting room with ticket office, lounge and rest rooms, located at the seawall with gangways leading directly to the ramp At 31st Street the seaplane terminal and equipment is identical with that at Wall Street, the only difference being in the arrangement of the facilities

As this is being written the announcement is made that TWA, Inc., may move from Newark to Floyd Bennett Field sometime in 1935, and a seaplane ferry service is planned to transfer air travelers quickly and conveniently from transcontinental planes to the center of New York, using trimotor Ford seaplanes It is confidently predicted that this is the forerunner of similar services for air travelers to and from many other principal cities having airports located 10 to 15 miles from business centers

Each white dot marks the location of an aerological station from which airplane soundings are now being made daily to an altitude of 17,300 ft.

The first of a series of articles to be devoted to the fundamentals of the air mass concept of meteorological phenomena. Written frankly for those whose interest in meteorology is active but not that of the specialist, they should prove a splendid introduction to a subject of rapidly increasing aeronautical importance.

Air Mass Mechanics

By Phillip Del Vecchio
American Meteorological Society

and Daniel Sayre
Assistant Editor of Aviation

TO A meteorological specialist there is nothing startlingly new in the theory that most of our weather phenomena can be traced to the interaction of warm and cold masses of air which possess certain definite characteristics depending on their geographical sources and paths of travel V Bjerknes of the Geophysical Institute of Norway first applied it practically to weather forecasting in time to have it adopted by the German meteorologist Georgii in mapping the weather for bombing raids over London during the late war It has since become the basis for the official forecasts issued in Norway, Sweden, Germany, Austria, Russia and several other countries, and its world wide adoption is well underwey

In this country it has been actively sponsored for the past six years by Professors Rossby and Willet of the Massachusetts Institute of Technology who have conducted elaborate researches into the American applications of the method It has also received attention at the California Institute of Technology and several other universities. The Navy meteorologists have used it increasingly for four or five years The Weather Bureau and the Air Corps have laid definite plans to incorporate it into their regular technique in the near future Among the airlines T W A, E A T and American have already used it in their routine work, and practically without exception the rest are actively interested. Most substantial measure of American interest is the network of 22 airplane sounding stations that has been established throughout the country Some seven of these are operated by the Navy Five are direct Weather Bureau enterprises The rest are adjuncts of the Air Corps, that at Boston being run jointly with M I T As we shall see such stations are a prime requisite for air mass studies

Basic types

But to return to our theory An air mass is simply a body of air, sometimes hundreds of miles in extent, which can be considered horizontally uniform for meteorological purposes Were the entire earth's atmosphere in as active motion and subject to as variable surface effects as it is in, say, the Eastern United States, it is doubtful whether any portions of it would ever become distinct enough in their properties to be

recognizable from their neighbors There are, however, great areas in the earth's polar and tropical regions where surface conditions are so widely uniform for long periods of time and where circulation is so stagnant or so steady that the atmosphere above them can take on and retain highly characterized conditions of vertical heat and moisture distribution

Obviously an air mass that has been conditioned in polar regions is going to be generally colder than one from the tropics. It is also apparent that an air mass which has long stagnated over the surface of an ocean will be higher in moisture content than one whose source is the interior of a continent By simply combining these two concepts we can make our first basic division of air masses and emerge with four broad types Giving them their usual meteorological names they are *polar continental, polar maritime, tropical continental,* and *tropical maritime*.

Conservative properties

Now these polar and tropical air masses are of more than mere academic importance to the weather of the middle latitude regions, for the world's atmospheric circulation is such, that there is a constant breaking away of these masses from their source regions to migrate through the temperate latitudes In fact our entire temperate atmosphere may be said to be made up of air masses once tropical or polar in source that advance, recede, interact with one another and in so doing produce most of the major features of our weather, as we hope to explain in future articles

Sufficient for this one, is the establishment of the fact that these migrating air masses have been found to retain certain of their original characteristics for long periods after leaving the regions where they are conditioned

Unfortunately for the simplicity of forecasting methods, the characteristics which they retain most stubbornly, called conservative properties by the meteorologists, are not those which can be observed at the usual weather station, namely the temperature, relative humidity, pressure, wind velocity and direction, and precipitation at a point of contact between the air mass and the earth's surface Even when we assume an isolated air mass unaffected by interaction with other air masses, these basic surface data are obviously subject to constant and varied modification by the character and profile of the area over which the air mass is passing by the amount of the daily insolation and radiation, by the turbulence of the wind by local circulations and by condensation and evaporation within the air mass itself.

Pressure and winds are not primary air mass characteristics anyway Precipitation, as we shall see, is due either to local action or to the interaction of two or more air masses Surface temperature is markedly dependent upon insolation, radiation and turbulence. It is also subject to changes attendant upon any condensation, precipitation or evaporation of the water content of the air In addition, as the air mass is raised by an increasing elevation of terrain below it or by encounter with another air mass, each element of it cools as it expands against the lower pressures prevalent at the new altitude Relative humidity, keyed as it is to the temperature, varies in response to the same effects and is even more directly modified by local conditions of evaporation condensation, and precipitation

Within the borders of the air mass then, the ordinary surface observations are of little use in the direct identification of the prevalent air mass. They are still quite indispensable near the boundary regions, or fronts as they are called between adjoining air masses for variable as they are, the surface temperatures in a polar air mass will tend to be lower than those of a tropical air mass lying next to it, and frequently the difference is sharp enough to indicate the location of the front, a thing of prime importance in applying the air mass concept to forecasting Several of the other directly measured surface properties are also useful in the same way

But to return to those properties that are conservative. There are but two of major importance They go under the formidable names of the *specific humidity* and the *equivalent potential temperature* but they both can be derived from ordinary observations of temperature and relative humidity by not overlaborious manipulation of a few graphs, tables and formulas.

Specific humidity

Specific humidity is defined as the weight of the water vapor present in a unit weight of moist air Short of cooling to the dew point it does not vary with temperature or with changes of volume. It is therefore free within wide limits from many of the characteristic-destroying influences which render relative humidity so unreliable in air mass study

To define the equivalent potential temperature it is first necessary to explain potential temperature As we have said previously, when an air mass or an element of it moves to a higher altitude, it cools due to an expansion against the reduced pressure A descent would, of course, be marked by a corresponding increase in temperature Since no heat from external sources would be added to or subtracted from the element during this change it is called an adiabatic process and it is possible to compute directly from the simple gas laws the amount of temperature change per increment of altitude For dry air this ratio very conveniently turns out to be 1 deg C for every 100 meters of altitude change It would therefore be possible to eliminate the variations of temperature due to the rising or falling of an air mass which contained no moisture by correcting all temperature readings to a standard pressure altitude, using this ratio The temperature so corrected is called the potential temperature

Equivalent potential temperature

But there is always some moisture present in the atmosphere which will have a marked effect on the heat content of the air if the saturation point is reached during any part of the air's motion, since heat is given out during condensation and is removed by precipitation A further correction to the temperature taking account of the amount of water vapor originally present, is therefore required This is accomplished by incorporating a humidity factor in our process of deriving the potential temperature The resulting figure can be given a physical meaning by describing it as the temperature that a volume of air would have if it were lifted adiabatically (without external addition or subtraction of heat) from its original altitude to the top of the atmosphere, thus ridding it of all its moisture by condensation and precipitation, and then returning it to some standard pressure altitude The standard usually taken in air mass work is that at which the pressure is 1 000 millibars (the equivalent of 750 millimeters of mercury).

We have then two properties, one of which will withstand changes of altitude and moisture content in conserving the original temperature characteristics of an air mass while the other conserves its humidity characteristics against wide ranges of altitude and tempertaure variation.

Even these two are quite variable within the range of surface effects due to insolation, radiation evaporation turbulence, and so on Merely changing the daily weather map surface station reports of temperature and relative humidity to the corresponding values of equivalent-potential temperature and specific humidity would be simply wasting a great deal of effort

But once above this range, and generally 4 000 or 5 000 ft. is ample an air mass is a remarkably recognizable sort of thing if one can unmask its conservative properties Hence the importance of airplane soundings in any thorough going attempt to use air mass analysis

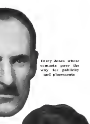
Of the importance of air mass analysis in any thorough-going attempt to use airplanes we shall speak next time as we take up the subject of frontal action between different air masses

Jobs for Students

The mechanics school must not only fit the student for a job but must help him find one.

By Lee Warrender and Richard Whatham

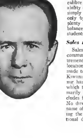
Casey Jones School of Aeronautics



Casey Jones whose contacts pave the way for publicity and placements

Richard Whatham, who coordinates sales effort and maintains student contact

Lt.-Col. George Vaughn, who manages the funds



Lee Warrender, who directs the operation of the school.

MECHANIC SCHOOL students are no longer willing to invest their hard earned savings for the thrill of boasting to their friends that they are going to "get into aviation" The men who are going to build tomorrow's transports and keep them in flying condition are not of the helmet and goggle wearing variety They regard aviation as a serious business and a business from which they intend to make a living. A school that does not give them all they need to equip themselves to obtain a livelihood out of aviation cannot long exist, but the responsibility of the school does not end there. The graduate cannot make a living until he has a job, and the successful school is not the one which turns out the most students It is the one that places the most of its graduates because it is able to fit its curriculum to the needs of the industry and to regulate the number and calibre of its students with careful thought as to the ability of the industry to absorb them This can't be done simply by hit-or-miss policies It can be accomplished only by a carefully planned and executed system plus plenty of hard work Our own program embraces a balanced plan of selling, training and placement of students

Sales methods

Sales effort is directed primarily towards the entire community within a radius of 50 miles of the school, a tremendous group to draw from because of our favorable location at Newark The majority of course sales are made to parents They may be reached through Rotary, Kiwanis, and other fraternal organizations Public speaking has been found to be one of the best vehicles with which to initiate sales effort All four directors are primarily salesmen and their general missionary work includes frequent talks before gatherings in the community. No direct selling attempt is made in any of them. The name of the school is rarely mentioned except in introducing the speaker The talks are devoted purely to educational discussion of aviation and its possibilities and to

building up a true sense of the progress and importance of the industry in the minds of as many persons as it is possible to reach collectively in the locality. More than 50,000 adults within the 50 mile radius have heard these educational talks since the school was established.

Prospective students are also reached directly by the public speaking method of approach. Vocational guidance is an important part of the work of modern high schools and similar institutions and speakers on aviation find a ready and appreciative audience. Students who evince particular interest or aptitude are contacted through the vocational director. Certain groups are contacted by direct mail letter, but catalogs are sent only to those sufficiently interested to reply. Personal calls are then made on parents by the commission salesmen and the prospects of an aviation career for the son discussed. The salesmen are licenseds pilots carefully trained to answer all questions accurately and without exaggeration. Men who have sold other types of educational services have been tried and found ineffective for this type of work.

Although the contract is usually closed by the salesman, other methods have been used where it was desirable to secure several students in a limited time to complete a class. In one instance $95 worth of telegrams were sent to a carefully selected list suggesting enrollment within four days and the messenger was instructed to wait for a reply. The result was eight new students at a sales cost of $12 each. Advertising of various sorts has been tried and the most valuable found to be a daily advertisement in a local newspaper and small space in the aeronautical magazines and school sections of national fiction magazines. Although this form of advertising is expensive because it must be done continuously it has provided a steady source of students.

Careful attention is paid to the matter of keeping a live prospect file, and deadwood is removed as rapidly as possible after all reasonable hope of closing a contract is gone.

Consider the employer

The subject matter of the courses offered is outside the scope of this article. Suffice it to say that first consideration is given to practical aspects of training. Even the engineering students get their hands dirty in the shop. Generally speaking, the curriculum and facilities are based directly on the recommendations of the maintenance superintendents of the various airlines and the factory foremen or department heads of the airplane or engine factories where the men expect to work. For example it was at the suggestion of a factory manager that the modern duralumin heat treating plant was recently installed in the school. Likewise machinery for instruction in sheet metal work has recently been added. The curriculum is so flexible that it can be adapted to changing needs of the operators and manufacturers. This has a direct bearing on the placement problem because, when a student is trained to suit an employer's ideas, the employer is much more approachable when the time for placing arrives.

If the good will of the operators who are prospective employers of graduates is to be retained, it is of tremendous importance that there is no interference with the operators' business particularly with regard to field maintenance and repair. A strict policy has been established that no repair jobs will be accepted by the school for student work, unless the crashed airplane is so severely damaged that an operator is unwilling to accept the repair job himself. As a result, the great bulk of the service work done at the school is sent in by the repair stations themselves. In such cases a flat rate of $100 plus the cost of materials, is charged for the complete reconditioning of the ship with student labor. It is thus possible to put many ships back into service that otherwise would be scrapped.

Getting the jobs

With training so closely fitted to the needs of prospective employers, the placement problem is substantially simplified. When a group of men is graduated, a representative of the school notifies the employers whose recommendations have been followed in the training period, and preference is naturally given to the specially trained men when positions are available. By this method it has been possible to find work for more than 90 per cent of the graduates to date. Obviously the success of the plan depends directly on constant personal contact with all divisions of the industry. A large proportion of the time of Mr. Casey Jones is devoted personally to this phase of the work and his extensive contacts and wide acquaintance in the industry have been large contributing factors to the success of the arrangement.

Every graduate is expected to obtain his Department of Commerce Mechanics license and, in the pre-graduation weeks of each class Mr. Warrender gives a great deal of personal attention to the individual instruction of the students about to take the D. of C. examination, which is preceded by a severe test involving 450 questions of his own design. If a student fails to obtain his license, he is run through the course again at the expense of the school.

The engineering courses are provided as background for practical work and for those who look beyond the mechanical phases of airplane manufacture and operation. Although no intention has been made of making designers of these men without additional experience and instruction their courses include such design subjects as stress analysis, mathematics, etc. Engineering classes begin twice a year and mechanics classes once a month. All courses run the full 50 weeks, a discouraging outlook for those not seriously interested in hard work.

Although all graduates are licensed mechanics their first jobs are as helpers, and not even the men who have taken the engineering courses for background are led to believe that their first jobs will be above that range. Many applications for short-term courses have been rejected as it is not believed desirable to train men who do not intend to make aviation a career.

Looking ahead

Regardless of our success in placing graduates to date, we realize that our future depends on the expansion of the industry. It is argued by some that the industry is already overcrowded, but a check up shows that relatively few competent licensed airplane mechanics are out of work today. Compared with other industries, there is no unemployment. We grant if there is no increase in the aviation business that no large number of replacements will be necessary. However we believe that there is every indication of a healthy and steady expansion during the next five to ten years, in fact, it may surprise even the most optimistic. Throughout the world, the importance of the airplane as a military weapon has been recognized and air forces are being enlarged. An adequate air force and a prosperous industry are essential to our national defense. Our fighting forces must be brought up to strength necessitating more aircraft and trained men to build them. The chaotic condition of our air transport, brought about by the cancellation of our air mail contracts, can be but temporary. The government must recognize the necessity for a helpful and constructive program which will permit the carrying of the mails without undue cost to the government but at a fair profit to the competent operator. Passenger and air express traffic is increasing steadily. Even private ownership of aircraft, which received a tremendous set-back during the depression, is showing signs of sound recovery. The public is gaining confidence in aviation and learning to adopt it to its economic advantage. It is for these reasons that we have confidence in the future and believe that we are not too optimistic in holding out hopes of employment to a select group of ambitious young men who share our confidence. If only a small proportion of the increase we foresee occurs, we contemplate no difficulty in finding jobs for our deserving graduates.

Martin Masterpiece

Concerning the structure of the new Martin-130 Pan American Clippers

The new Clipper weighs but 23,100 lb empty, lifts a gross load of 51 000 lb

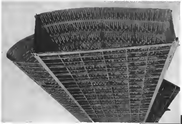
To soy that a flying boat is the biggest yet built in America and can carry a gross weight of 51,000 lb is to call it a very important step forward in flying boat development.

To say that it is also designed to have a top speed above 170 m.p.h. and to cruise for 3 000 mi with a huge load of passengers and mail is to claim for it a place among the most remarkable of the world's aircraft.

And yet to leave the significance of the new giant Martin boats at that would be to miss by a wide margin the whole crux of their importance to the art of airplane design.

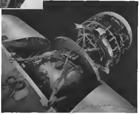
Certainly as one stands under the wing of the completed ship, or studies the construction of the others still in the factory, one's most absorbing impression is not that these ships are the result of a super refinement of past developments, but that they represent the first brilliant examples of a new technique. Three years ago the boldness of the Pan-American staff in laying out the service requirements for these ships and the courage of the Martin staff in accepting them were the wonder of the industry. Today the first completed ship stands a splendid testimonial to the effectiveness of a partnership between a manufacturer and a customer who can agree that the way to new triumphs lies off the road of traditional practices. Putting it conservatively, there are enough new economies of structure and aerodynamic perfections incorporated in its design to bring boats of twice the size out of the realm of futuristic dreams into the immediate present of engineering practicalities.

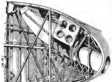
The full story of the research, of the wealth of detailed study, of the complex engineering work by both Pan American and Martin that has gone into these ships would fill a bulky report, but the outstanding features can

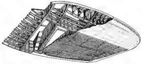


The wing construction is particularly adapted to large sizes. Corrugated alloy sheet extends along the top of the entire span between the front and rear spars. The spars have solid web plates reinforced by vertical stiffeners, but almost no upper flange area and only sufficient lower flange area to carry the compression loads in the inverted flight condition. The verticals of the ribs are tubular, the diagonals are channels riveted back to back. A smooth covering of flat alloy sheet is placed over top and bottom surfaces back to the rear spar, from there to the trailing edge fabric is used. The wing section is a modified Göttingen 398. The stressed sheet is of 24ST aluminum alloy, as it is throughout the ship.

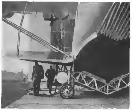
The power plant consists of four twin-row R1830 S1AG Wasp engines geared three-to two and rated at 800 hp at 7 000 ft. turning three-bladed Hamilton-Standard controllable pitch propellers. The engines are easily demountable for service work either at the firewall in front of the 99 gal oil tank or at the point of attachment of the mount at the front spar. Below is shown a sketch of an oil cooler installed in an air duct running from a point just below the leading edge to the top surface of the wing.







Above: The construction of a "sea wing" that serves as sponson, lifting surface, and a 924 gal fuel tank. As in the hull, the corrugated bottom sheeting is also used directly as the bottom of the tank. Left: An overall view of the "sea wing" showing its relation to the hull and the wing struts. The handling cradle is also of interest.



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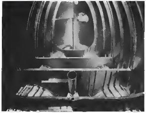
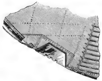
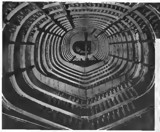
The tail surfaces, with the exception of the part of the fin lying below the stabilizer are fabric covered. All are of alloy framing. Elevators, and rudder are equipped with trimming tabs adjustable from the cockpit. Similarly equipped and of the same construction are the ailerons.

Construction Details of the Martin Clipper





Left: A sketch of the anchor in place. Of special design it folds and aligns itself automatically as it is raised into the hull by means of a hand winch. In place as shown it forms an extremely rugged breakwater for the prow of the hull. Above: A view into the bow compartment. In the immediate foreground is the tube used to guide the anchor into place.



Left: A view of the extremely simple interior hull construction made possible through the use of corrugated bottom and deck covering. The few longitudinal strips shown in the picture are not a part of the permanent structure. Below: The construction of a typical bulkhead, in a view which gives an idea of the hull contours.

be as simply described as those of a suspension bridge. They fall naturally into four major design concepts

The first is the use of corrugated alloy sheet in the bottom and deck of the hull. Effective structurally in carrying both tension and compression in bending loads, highly resistant against local punching impacts, it permits a radical simplification of the internal structure. It has also allowed two of the amidship hull compartments beneath the floor of the cabin to be utilized directly as a fuel tank. The top of this tank is, of course, separate from the floor structure and an adequate positive ventilation has been provided, but its sides and its bottom are also the external skin of the hull itself. Saving in tankage weight, saving in hull stresses due to the direct support of the fuel, decreased height requirements and a lower center of gravity are obvious results

The second is the substitution of "sea wings" for wing floats. Hydrodynamically, these act as large sponsons, permit turns of short radius, eliminate the sudden changes in rolling and yawing moment encountered in rough water with wing floats. They also eliminate the hazard of having a wing float wrenched away by the impact of an open sea landing. Aerodynamically they have a lifting value about 50 per cent of that of an airfoil of corresponding area, and eliminate the drag of wing floats. So carefully has the relation of these "sea wings" to the overall airflow been studied that final model tests showed a total drag greater without the "sea wings" in place than when they were present. They, too, serve directly as fuel tanks

The third is the successful extension to much larger dimensions of the principles of wing construction developed for the Martin bombers It is best understood by studying the attached photograph, but briefly it makes a virtue of its large size by diverting each type of stress into a structural element ideally designed to carry it

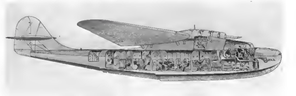
The fourth is a preservation of simplicity in the design of control surfaces, of engine nacelles, of the transitions from hull to empennage and from hull to wing The controls are single surfaces throughout Nowhere is there a discontinuity between major parts of the structure requiring exposure of supporting struts. Nowhere, in fact, is there a part of the design in which the interference flow between various elements has not been kept at a minimum Even the bottom of the center section has been tapered upward toward the center line of the ship to permit better flow between wing and hull

Many of these features are not new, of course. As we have said, the wing construction was originally developed for the bombers. Integral float tanks were used in the Martin XP2M-1. Wide sponson-wings have been used extensively abroad. Careful interference flow studies are a feature of all advanced modern projects But their union in a single giant boat design is new and, as we have indicated, it is strong medicine

A great many of the details of the construction we present in the accompanying half-tones and sketches We also offer a few statistics on the sheer magnitude of the craft that anyone with a slide rule and a little imagination can extend indefinitely. The horizontal tail surfaces, for example, have the span of a Fledgling and an area equal to that of a Monocoupe wing. The main wing span is three times that of a Stinson Reliant and the ship has ten times the effective lifting area And so on ad infinitum More substantial are the following specific data:

Wing including ailerons	2,173	sq ft
Sponson effective area	145	sq ft
Total lifting area	2 318	sq ft
Stabilizer	203 8	sq ft
Elevator, including balance	152 2	sq ft
Fin	84 1	sq ft
Rudder including balance	88 8	sq ft
Total horizontal tail area	355 8	sq ft
Total vertical tail area	154 7	sq ft
Weight empty	23 100	lb
Useful load	27 900	lb
Gross weight	51 000	lb
Wing loading full load (2 318 sq ft)	22 03	lb/sq ft
Power loading full load (full throttle)	12 94	lb/hp
Total fuel capacity	4 000	gal

A mock-up of one side of an interior compartment showing the conversion of seats into sleeping compartments



An artist's perspective of the interior arrangements for passengers, mail and crew. The exact number of passengers and the weight of mail accommodated are extremely elastic Maximum seating capacity is 48 Leading forward from the rear of the hull are shown a companionway to the rear deck, a lavatory, two regular passenger compartments, a large lounge, a third passenger compartment, a baggage room with space for galley, and a mail compartment Above the hull floor level are shown the working quarters of pilot, co-pilot, radio operator and flight mechanic Of striking interest is the location of the flight mechanic in a separate control room just under the wing To him has been assigned all engine instruments and power plant controls save the tachometer, the throttle, and the manifold pressure indicator for each engine which are retained by the pilot

OPERATION AT DESIRED CRUISING CONDITIONS, PART TEN

Winds, and Control of Scheduled Time

In a previous article the authors have discussed the variable factors that govern the elapsed flying time between airline stations. The development of simplified control charts and the effect of winds are discussed in the current presentation.

By Edmand T. Allen and W. Bailey Oswald

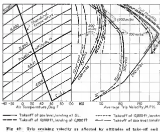


Fig 47 Trip cruising velocity as affected by altitudes of take-off and landing, length of trip, altitude of level cruising flight, and percentage of rated engine power. Climb is in low-pitch at 75 per cent power and level cruising and descent are in cruising pitch of the stated power

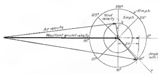


Fig 48 Vector diagram of velocities showing effect of wind velocity on air velocity and direction of flight when it is desired to maintain a given resultant ground velocity and direction

IT HAS been seen that the trip velocity is modified from the level flight cruising velocity by the climb from the field of take-off to the level cruising altitude, and the descent to the landing field The manner of climbing and descending, the altitudes of the take-off and landing fields, and the length of the trip have been considered in preceding articles The individual effects of each factor have been shown. The general result is illustrated by Fig 47, which shows the trip cruising velocities at 50 per cent and 75 per cent power for short and long trip lengths, where the take-offs and landings are made respectively at sea level and/or 10 000 ft. altitude It will be noted that take off and both take-off and landing at altitude increase trip velocity, while landing at altitude decreases the trip velocity slightly The effects are greater for shorter distance The 75 per cent power, low-pitch climb and 400 ft per minute descent are assumed for the trips. These limiting values are generally recommended, but are subject to the terrain and in any case should be modified if there is any benefit to be derived

For a particular trip on an airline all of these variables become constant or so nearly fixed that the pilot need keep no variable control over them For flight in one direction over a specific airline division, the length of trip and altitudes of take-off and landing obviously are constant, and the manner of climbing and descending will be approximately established. Calculations and flight tests have demonstrated that the speed for climb and rate of climb are approximately compensating in their effects on trip velocity. The rate of descent has greater effect, but is soon established within close limits.

A simple cruising chart of trip velocity versus altitude for various percentages

of rated engine power can be drawn for each direction of each trip on the airline, as shown in Fig 52. (The wind-correction scales at the top of this figure will be discussed later.) Where there is no wind, the indicated air-speed and r.p.m. (or manifold pressure), and the altitude and direction of flight can be outlined for each interval of time. The pilot is thus able to regulate his flight according to a control chart as given in Fig. 54. The characteristics are constant in each portion of the flight, however, for no wind. Either time or distance is suitable as a reference abscissa. Landmarks, when visible, are of considerable aid in checking the progress of the flight, but the use of time as the reference has the advantage that it is equally available either in clear or blind flying. Furthermore, the effect of wind in changing reference locations is eliminated. The climb should really be regulated versus time rather than distance as consideration of the wind effect makes clear. Principal reliance on time as the reference seems to be advisable since less confusion would result when flying blind than if distance (i.e. landmarks) were normally relied upon. Both distance and time have been plotted on the abscissa scale in Fig 54.

A series of marker beacons at close intervals along a flight path would be of value in contributing to safety and precision, since the pilot would then know his location and progress even though the ground were not visible. The location of the airplane would then be defined in space by the directional radio beacon, altimeter, or height indicator, and marker beacons along the airway.

Winds aloft, however, remain a variable for which the pilot must compensate during each flight if a regular schedule is to be maintained. Accurate adherence to a definite schedule is preferred to the rather haphazard schedule which results from the use of constant-power cruising uncorrected for wind effects. The schedule should, of course, be arranged to conform to average wind conditions throughout the year, but at the same time so adjusted that higher winds will not interrupt the schedule too often because of limiting maximum cruising engine power. Arrivals either considerably ahead of, or behind, schedule tend to develop an impression of unreliability among air travelers. They are generally inefficient since an airplane should not depart ahead of schedule even though it arrives early. Furthermore, an airline will benefit from knowledge of the winds to the extent that the lowest possible cruising power will be required in order to make the scheduled time.

Wind requires that a modified flight velocity and direction be established when it is desired to proceed along a certain path at a given velocity. The well known vector diagram of velocities is illustrated in Fig 48. The diagram shows readily the velocity and direction of flight necessary to maintain the given ground cruising velocity for various wind velocities and directions. Correction to the velocity and direction can be obtained from this type of diagram, or mathematically.

A correction for an average value of the cruising velocity is sufficiently accurate since the correction varies only slightly within the probable range of cruising velocities. The wind velocity is seldom known to within less than about 5 m.p.h., and its direction to within about 10 deg. Soundings can perhaps be relied upon for slightly greater accuracy, but variations with time and estimated variation of the wind between points of observation may be in considerable error. The corrections to velocity and direction are, therefore, determined on the basis of an average cruising velocity of 180 m.p.h. These corrections, determined as shown in Fig 48, are plotted in Figs 49 and 50.

In Fig 49A the magnitude of the wind is represented by the semi-circles, and the direction the wind makes with the desired path by curved radial lines. The correction to the normal cruising speed necessary to maintain the desired path velocity is then given directly below on the horizontal line. An illustrative example is worked on the figure. An alternative type of chart is constructed in Fig 49B. Figures 50A and 50B are similar to Fig 49A and 49B, but show the correction to the direction of flight required for a desired resultant direction.

These auxiliary charts for velocity correction due to wind can be conveniently included on the level flight cruising chart as done in Fig. 51. It should be noted especially that these correction charts give the air velocity and direction necessary to maintain a given path velocity rather than the path velocity resulting from the given airspeed and wind. Of course the reverse solution is possible, as brief study will show. The circles and double line on the figure illustrate the airspeed, hence r.p.m. and power, that is necessary to maintain a cruising velocity of 175 m.p.h. with various assumed headwinds at the several altitudes. The more severe headwinds and wind directions at the higher altitudes here assumed, more than counteract the normal increase in level cruising velocity with altitude, so that the lowest necessary engine power is required by flying at 11,000 ft. altitude. 67 per cent power is required which gives an airspeed of 195 m.p.h. (but ground speed of 175 m.p.h.), at 1,720 r.p.m. (or 155 m.p.h. indicated velocity).

The trip cruising chart based on a given scheduled time requires wind correction data for the purpose of establishing schedules. In Fig 52 there has been plotted the trip velocity versus altitude and per cent powers for a 500-mile trip on a proposed airline in which the take-off is made at 4,000 ft. and the landing at 1,000 ft. The compass course is 240 deg. (60 deg. west of south). The average wind throughout the year is assumed to be 20 m.p.h. at 195 deg. at all practical

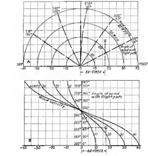


Fig 49. Correction to cruising velocity in air due to a given wind velocity and direction off desired course for maintaining a desired ground velocity. Corrections are approximately correct for ground velocities from 160 to 200 m.p.h. Example: Wind 25 m.p.h. 50 deg. off course gives ΔV = 17 m.p.h.

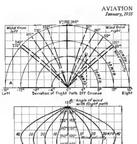


Fig 50. Compass heading correction, due to wind with given velocity and direction, required to maintain a desired ground course. Change is approximately correct for velocities from 160 to 200 m.p.h. Example: a 30 m.p.h. wind, 50 deg. off course requires 5 deg. deviation to the right

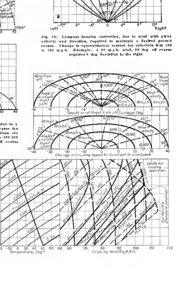


Fig 51. Cruising chart in level flight showing velocity with wind correction charts (Douglas Transport DC-2). Example. For the following wind conditions the per cent power required to maintain 175 m.p.h. varies with altitude as shown.

Density Altitude	Wind Velocity (m.p.h.)	Wind Direction From Course (degrees)	ΔV (m.p.h.)	Change in Angle (degrees)	Per cent Power
S.L.	0	0	0	0	76
5,000	20	70	11	7	76
10,000	30	50	18	4	68
15,000	20	0	20	10	68

175 m.p.h. ground speed is obtained with lowest output by flying at 11,000 at 1720 r.p.m. Indicated vel. 155 m.p.h. which requires 67 per cent power. Air velocity is 195 m.p.h.

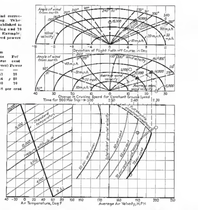


Fig 52. Trip velocity cruising chart with wind corrections. Trip, 500 miles, compass bearing 240 deg. Take-off —4,000 ft., landing 1,000 ft. Schedule is established to maintain 67 per cent power against average wind and 75 per cent power against average maximum wind. Example: for average wind velocities as follows, the required powers etc., at various altitudes are:

Density Altitude	Wind Velocity (m.p.h.)	Wind Direction (Compass Bearing) (degrees)	ΔV (m.p.h.)	Compass Course (degrees)	Per cent Power
0	0				
5,000	20	210	+11	247	75
10,000	20	200	+15	244	80
15,000	30	240	+25	000	70

The best condition is obtained at 11,000 were 68 per cent power is required.

altitudes, and the maximum probable adverse wind for a considerable number of days is assumed to be 30 m p h at 195 deg When the proposed schedule is chosen such that the normal cruising power is 67 per cent, at 14,000 ft, the power with maximum probable wind becomes 75 per cent, which corresponds to the maximum permissible value The resultant average ground velocity for the trip is 175 m p h, which gives a scheduled time for the 500-mile trip of 2 hours and 51 minutes The wind correction chart is included on this trip schedule diagram.

The pilot or ground operating personnel can determine through use of Fig 52 best altitude for the minimum percentage of required engine power, and fly accordingly It will often be sufficiently accurate to assume average wind characteristics throughout the entire trip Where much change in either direction or magnitude occurs, however, it is advisable to correct at several positions along the flight, and thus modify the flight throughout

When the winds aloft are known a short time in advance, or where the pilot has means for receiving information as it is obtained by ground personnel, it is suggested than an operating schedule be constructed The operating schedule, as briefly described in earlier paragraphs, contains curves of density altitude, r p m., indicated velocity, and direction of flight, from which the pilot can control his flight with reference to time or distance. From the trip velocity and wind correction charts of Fig. 52, the percentage of engine power, altitude and compass bearing are determined The r p m and velocity throughout the flight are then obtained from the climb, level cruising, and descent charts of Figures 35 or 36 38 (AVIATION, November, 1934), and Fig 51 Plotting these values versus the time scale, or corresponding distance, gives the operating schedule chart as shown in Fig. 53. The 75 per cent power low-pitch climb is generally maintained for all flights

When soundings have been obtained at several stations along the airline, the operating curve can be drawn and faired throughout its length This has been done in Fig 53 The path for which the control is then outlined represents the path along which minimum power is required with the existing wind conditions for meeting the desired scheduled time

The plotting of per cent power on the curve is particularly helpful in preventing the power at any point of operation from exceeding the cruising limit It is most consistent from the standpoint of uniformity of power output and engine reliability to use a mean constant value of the power throughout the flight (Except for the 75 per cent power climb) Except where there is a sharply defined variation of wind with altitude, it is believed advisable in the interest of passenger comfort to fly in the "level cruising" portion of the flight along an average or uniformly varying altitude Numerous changes in altitude causing possible discomfort to some passengers, are not justified by the possibility of only slight gain in trip velocity The entire flight must be consistent with the type of service to be offered, in speed, comfort, economy, and safety, hence cannot stress one factor to the extent of losing the desired quality in another Fig 54 has therefore been drawn with averaged values of the various characteristics Note that the excessive engine power previously appearing in the latter portion of the flight has been "smoothed out." The various intermediate points along the line are passed at slightly different times but the destination is reached at the desired time Question might arise to the effect that altitudes may be slightly different from the best if gaged by a time scale since the best altitudes are really known at definite locations. Nevertheless, the altitudes for corresponding times will be well within the possible precision of operation of the airplane and knowledge of the winds. The degree to which the altitude and compass bearing curves can be smoothed out without seriously affecting the time depends, of course, upon the sharpness of the boundary of the winds In fact, it may be advisable in certain cases to slightly increase the cruising power above the minimum if necessary, in order to avoid making uncomfortable variations in altitude.

A 500-mile flight, if operated entirely by reference to time alone, should come within an average of about ± 3 minutes, or ± 2 per cent, of the scheduled time, or a maximum error of ± 5 minutes, or about ± 3 per cent, even when the entire flight is made blind. Reference to landmarks enables the pilot, by slight adjustment to reach the destination almost exactly on schedule, and through proper control to insure a minimum of power required, hence a minimum of fuel consumed, and the least possible engine wear consistent with the flight

The operating schedule curves of Figs. 53 and 54 furnish the pilot with all the information necessary to control the scheduled flight between two locations. Radio beacons practically eliminate the necessity for compass bearings Other simplifications may later be introduced. It is not outside the realm of possibility that the control of the entire flight be made automatic, when the required settings of controlling media may be outlined in advance

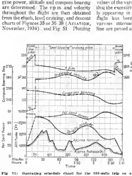


Fig 53: Operating schedule chart for the 500-mile trip on a 240 deg. compass course. Variations shown maintain the desired average ground speed with minimum required power. Circles indicate altitudes chosen from wind velocity soundings

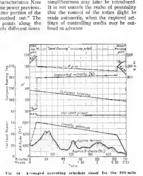


Fig 54: Averaged operating schedule chart for the 500-mile trip on a 240 deg. compass course. Note that constant cruising power is maintained

EDITORIALS

AVIATION

Bigger and Better

ONE of the frequent criticisms leveled against the builders of the U.S.S.R. has been that they have made a virtue out of sheer size The importance of public buildings, works of art, airplanes, seems to be definitely related to their magnitude. We are in no position to take sides over matters of art or architecture, but we are beginning to suspect that their aeronautical people have been on the right track in visualizing the airplane of the immediate future in terms of ships like the "Maxim Gorky" with its 200-ft wing spread

Quite apart from economic, aerodynamic, or structural considerations, large size in airplanes has something to commend it *per se* It leads directly to public confidence To the layman, the big ship looks safer than a small one Large compartments, ample entrance doors, and companionways, connote to him the safety of the Pullman, the stability of the ocean liner Pan American, for example, has proven to its own satisfaction that simply to let the public come aboard to inspect the ships of the Clipper class, automatically sells tickets People make many trips in the larger ships who hesitate to fly in smaller craft under exactly the same operating conditions In the big ships they lose any feeling that they are doing anything unusual—flying simply becomes so much transportation It is not to be wondered at, therefore, that foremost among the proponents of large flying units has been Pan American Airways Not only have its special problems of long-range overseas routes been a constant spur toward the development of large planes, but the function of the large ship as a traffic builder has long since been recognized.

It is one thing, however, to make a fetish out of hugeness and quite another to expand the size of the airplane to keep pace with the demands of traffic and the ability to build Pan American has made continuous progress, step by step, from the S-38s up to the Martin 130 described in this issue, but every advance in size has been built upon a solid foundation of accumulated experience

There are encouraging signs that other operators and designers in America are again turning their attention to larger sizes for transports of all classes The idea went off half-cocked several years ago when Fokker's F-32 and the Ford 40-passenger machine appeared The first, while aeronautically successful, was an economic failure because its capacity was greater than dictated by the demands of the period The second failed structurally before it ever got off the ground because of a lack of appreciation on the part of its designers of the problems involved in the handling of large-sized planes. But a great deal has been learned since then. Traffic on certain trunk lines is building up to the point where larger units can be economically justified Experience with the building and handling of ships of the Boeing, Douglas, Condor or Clipper class in this country and the Hannibals, the Scyllas, and the F-XXs abroad has furnished a sound basis for the next steps to still greater airplane size By and large, it seems quite within bounds to begin to think once more in terms of 40, 50, or even 100 passenger units for the near future with entire confidence in the ability of designers and manufacturers to build them, and with a reasonable expectation of filling them regularly with cash customers

Railroads Go Streamline

AT LEAST a half a dozen times since M-10001, Union Pacific's aluminum streamlined train, slid into New York some 57 hours out of Los Angeles, acquaintances have rushed up brandishing newspapers, shouting something about this being the answer to our airplanes,—obviously expecting us to get pretty indignant about it

We have been able to preserve our usual calm, however, for even a 57-hour cleared track record (we doubt seriously if regular schedules much under 80 hours can be attained for a long time to come) is not particularly impressive in the face of daily 16 to 18 hours airline schedules, or 12 hour "cleared track" runs by Captain Rickenbacker and his associates

Our first reaction, rather than being one of alarm at the prospect of competition (if it can be called that) on a basis of scheduled speeds, has been more of commendation and congratulation to the railroad for having at last thrown off the technical apathy that has prevented any radical change in essential design for 75 years or more The development of such remarkable trains as Burlington's stainless steel Zephyr and Union Pacific's aluminum M-10001 are achievements to arouse the enthusiasm of anyone interested in the transportation problem Significantly enough, when the railroads finally did overcome their inertia sufficiently to consider radically new designs, they looked to the airplane for guidance in the selection and disposition of structural materials, for most efficient external form for their trains, another indication that the aviation

industry is rapidly attaining a position of undisputed leadership where refinements in design and in manufacturing technique are of importance.

What most people have missed in thinking about light weight streamlined trains (and it is the factor that holds the greatest element of hope for the railroads and the greatest threat to the airlines) is not speed, but costs.

It is not news that trains can attain speeds of over 100 miles an hour. (New York Central's famous locomotive No. 999 hauled the Empire State Express at 112 m.p.h. in 1893), but it is of great significance that it will be possible to operate trains regularly at costs far below present day averages. Elimination of dead weight and the use of more efficient power plants will do the trick, and the consequent savings in millions of dollars annually can eventually put the railroads in a very strategic position in the transportation field. This cannot happen overnight of course, for it will take years to retire old rail equipment and to replace it with the more efficient units, but the handwriting is on the wall, and it behooves everyone who has anything to do with the aviation industry to exert all his energy toward making air transport not only the fastest, safest and most comfortable means of getting about, but also the most economical. We have little to fear from speed competition, but the threat of ever shrinking rail passenger rates must be faced squarely if air transport is to stay in the running.

A New Service

ALTHOUGH there is no substitute for hard work in achievement of success in commercial aviation operation, the ways and means in which one's energy may be directed are limited only by the ingenuity of the individual. There are no printed manuals of fixed base or flying school operation, but there is a crying need for some medium of exchange of thought so that each operator can profit by the ideas of others and in turn submit his own success formulas for the enlightenment of his fellows.

The commercial field as a whole is composed of a large number of highly localized operations. It is of course true that competition is keen between some large neighboring fields, but operators so situated make it their business to know their rival's methods. There is nothing to be lost and much to be gained by publishing information on successful operating ideas in an industry whose units rarely seek business beyond a 50 or 100-mile radius.

In the ensuing months it is the intention of our editors to seek out and publish articles, long and short, on the policies of those operators whose success has given proof of the value of their methods. A typical case is the contribution on the conduct of a mechanics' school found elsewhere in this issue. In addition we have inaugurated a new department in which the commercial

operators are requested to submit opinions on the many detail problems that must be solved in the daily conduct of their business. To start the ball rolling we have proposed a question for the specialists in sightseeing flights and we have had a gratifying response. We have many other controversial questions in mind, but we hope that our operator-readers themselves will assume the rôle of inquisitors and submit frequent requests for opinions to their colleagues through our columns. We have no intention of restricting ourselves to the larger enterprises, we are interested alone in worth-while ideas of tested merit whether they come from men whose operations involve 1 or 50 airplanes, or whose student enrollments comprise 1 or 100 students.

We are looking forward with great pleasure to the time when service operators, large and small, will be regular contributors to AVIATION.

Flying to the Airport

ONE of the fundamental problems that must be solved by air transport operators if they are to compete effectively with the railroads is that resulting from the remoteness of most airports from centers of population. Aside from the time loss in ground transportation to and from airports, which is ruinous for the shorter flights, there remains in the minds of many prospective passengers an inherent resistance to patronage of the airlines and the relative proximity of rail and air terminals plays an important part in the decision as to which form of transportation to use.

An important forward step toward the solution of this problem has been taken by TWA Inc. in its announced intention to operate seaplane shuttle service between its Eastern terminal and one of New York's new municipal seaplane ramps now in the process of construction. The shuttle service, which is to utilize surplus equipment and should reduce the city-to-airport time to about ten minutes, is discussed in detail elsewhere in this issue.

There are many problems involved in regular seaplane operations in congested harbors. Although every airport does not have facilities for water craft, most large cities are possessed of some sort of waterfront and amphibians can always be used where airports are removed from water areas. The element of expense appears to be considerable at first sight, but if even a few additional passengers are converted to air travel by the attractiveness of the service and it is possible by interline cooperation to carry reasonably full loads both ways, the revenue from the present form of ground transportation should go a long way to defray the expense of shuttle operation with depreciated equipment.

The proposal has much to recommend it and a detailed study of its possibilities by other operators and at other terminals should result in the establishment of similar operations in other parts of the country.

NEWS *of the* MONTH

★ ***Federal Aviation Commission*** **concludes hearings with testimony from airplane and engine manufacturers . . . starts drafting final report.**

★ ***Services*** **. . . War Department awards large contracts for Northrop attack planes, Consolidated pursuits, Douglas observations, Seversky trainers.**

★ ***Air Mail and Transport*** **. . . Martin flying-boat makes first flights . . . Pan American orders four new Sikorsky Clipper Ships . . . Airlines speed up schedules with new equipment . . . NRA approves amendments to Air Transport Code . . . Post Office Department adds new schedules to mail routes.**

★ ***Financial*** **. . . TAT, WAE, GAC liquidate in compliance with Air Mail Law . . . Federal court approves Glenn L. Martin Company reorganization plan.**

★ ***Airports*** **. . . New York City leases Glenn L. Curtiss Airport.**

★ ***Flights*** **. . . Wiley Post attempts to set new altitude record.**

★ ***Foreign*** **. . . Imperial Airways inaugurates England-Australia mail service . . . KLM makes experimental flight to Curacao, Dutch Guiana . . . French vote huge aviation budget for 1935.**

Final hearings

RECOMMENDATIONS for changes in government procurement policy were made by leading manufacturers before the Federal Aviation Commission in the concluding days of its hearings.

Thomas A. Morgan, president of Curtiss Wright Corporation, Sperry Corporation, and the Aeronautical Chamber of Commerce, recommended four specific steps to develop a strong industry: abandonment of competition by government agencies in the design and construction of airplanes and engines, establishment of the principle that in contracting for experimental or development projects, full payment for services rendered be made to the contractor, definite elimination of the so-called speculative development policy as a means of procuring experimental aircraft, the establishment of a policy which would place contracts with firms possessing adequate manufacturing facilities and design staffs so that reasonably uniform production may be maintained.

In dealing with procurement, Mr. Morgan offered a procedure by which the government could protect itself against monopoly: design competition based on directive information furnished to private manufacturers by the Services, procurement of one or two experimental airplanes from each of the three or four best designs, including sufficient extra materials for static test purposes, purchase of a service test order of two of the best airplanes; procurement of airplanes in production quantities by use of the negotiated contract, enactment of such minor changes in the Procurement Act of 1926 as are necessary in order to definitely establish the legality of negotiation as a proper method for procurement of aeronautical equipment in production quantities, complete recognition by the government of design rights and of the proprietary nature of airplane or engine designs, removal from the standard government contract forms of the present patent clauses and the substitution therefor of clauses which recognize the fact that patented inventions are the property of the inventor.

Mr. Morgan further recommended that government procurement agencies have associated with them a competent engineering staff capable of carrying out the functions of specification, inspection and testing, that a continuing program be established and announced to the industry so as to permit adequate planning and an orderly development of types, and that the National Advisory Committee for Aeronautics be supported by sufficient appropriations to permit it to carry on fundamental research work.

Basing his conclusions on first-hand studies made of European aviation over a number of years, Mr. Morgan stressed the importance of developing an export market to help build up and maintain the industry at home. Foreign competition is keen and we may lose ground already gained unless the government adopts a sound program to encourage the industry while still in its formative state, he said.

C. L. Egtvedt, president of Boeing Aircraft Company, had four recommendations for a permanent procurement policy. These included negotiated contracts with qualified manufacturers on quantity production, supplemented by either direct negotiation or open competition on experimental projects, standardized accounting for all governmental agencies in auditing negotiated contracts, supplemented by a broader interpretation of profit limitation, abandonment of audit and profit limitation in contracts obtained in open competition, curtailment of design supervision on experimental projects.

Other manufacturers strongly endorsing the policy of negotiated contracts as the most satisfactory means of meeting the requirements of the government were L. R. Grumman, president of Grumman Aircraft Company, and Donald Brown, president of United Aircraft Corporation.

Glenn L. Martin, president of the Glenn L. Martin Company, outlined another procurement plan. He suggested that as a preliminary to design competitions an aircraft type directive giving the general requirements for the plane should be offered to the entire aircraft industry, as well as a statement that three or more separate orders for one plane each would be let to the three or four best designers. Contracts made as a result of the competition should be at cost plus a fixed profit, or at a fixed price, announced with the invitation to bid, to all successful contractors. For quantity production orders the government would invite sealed bids from the three or four winners of the open design competition, thereby securing the value to be derived from complete competition. An important by-product of the method, Mr. Martin said, would be the maintenance of a larger number of successful groups of aircraft builders which would be available in case of national emergency.

Disagreeing with the testimony of every other manufacturer Mr. Martin criticized sharply the policy of negotiated contracts. He described it as an unregulated form of the old-fashioned cost-plus system wherein the government becomes the arbiter in the determination of cost and has to assume the responsibility for occasional misjudgments of cost prediction. Furthermore, he argued, in negotiation there is always the liability of well grounded differences of opinion as to what constitutes cost. The problem of losses in building experimental aircraft has been a thorn in the side of procurement officers and manufacturers for years, he said.

Speaking as an engine manufacturer, Guy W. Vaughn, president of Wright Aeronautical Corporation, recommended that the government adopt a planned program designed to assist the industry

in coping with its special problems He said this program should insure continuity of production, reduction of the existing large labor turnover, and maintenance of complete organizations including engineering and production personnel; it should embrace a long-range development program to make sure that the United States be at all times on a parity with, if not ahead of, the aeronautical development of other nations

Opposed to government production of aircraft engines, Mr. Vaughn stated his opinion that private competition alone is now very effective in keeping development continuously advancing insofar as available funds will warrant Endorsing negotiated contracts, he stated that procurement by competitive bidding was totally unsuited for highly developed and complex articles such as aircraft engines since it would stifle development, tend to create monopoly, cause wide fluctuations in production volume, and, finally, might result in the purchase of obsolete equipment He recommended also, that changes be made in the Procurement Act of 1926 which would clearly establish contract by negotiation as a legal and proper means of procurement Referring to the matter of export, Mr. Vaughn urged that the government give every possible assistance to the industry in increasing export sales He pointed out that our European competitors are giving their manufacturers assistance in finance as well as in sales promotion

Samuel S. Bradley, general manager of the Manufacturers Aircraft Association, urged continuation of the policy permitting cross-licensing airplane patents believing that it prevents wasteful patent litigation and encourages general use of airplane patents Proclaiming the superiority of American aircraft, Mr. Bradley charged that subversive propaganda had been aimed at the aviation industry by critical citizens and aliens who were trying to establish the belief among potential foreign customers that American equipment was inferior

Leighton W. Rogers, executive vice-president of the Aeronautical Chamber, presented two specific recommendations bearing on export policy, namely adoption by the government of a definite and clearly stated policy of encouragement to the export of aeronautical products, and resumption by the Department of Commerce of its former policy of assisting in the promotion of foreign sales Mr. Rogers joined with Mr. Bradley in condemning foreign aeronautical agents who attempt through the press and in other ways to discredit American equipment

J. K. Kindelberger, president of General Aviation Manufacturing Corporation, expressed the opinion that continuation of existing legislation governing air transport and aircraft manufactur-

CALENDAR

Jan 9-10—Semi-Annual Meeting of the Operations Committee of the Aero Chamber, Miami, Fla.

Jan 10-12—Seventh Annual All-American Air Races, Miami, Fla

Jan 15-16—Aircraft and Aircraft Engine Sessions of the Annual S.A.E. Convention, Detroit, Mich

Jan. 29-30—Annual Meeting of the Institute of the Aeronautical Sciences New York City

Jan. 31—Annual Meeting of the Aeronautical Chamber of Commerce of America, Washington, D C

Feb 1—Meeting of the Manufacturer's Aircraft Association, New York City

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ing will bring ruin to the industry, and urged that the FAC recommend corrective legislation.

A broader and more comprehensive use of the new air mass analysis for weather forecasting was recommended by Maj. James A. Doolittle, of the aviation department of the Shell Petroleum Corporation, who also emphasized the need for increased appropriations for new scientific weather data as recommended by the Baker Board of which he was a member

Following the testimony of the manufacturers, the Commission gave further consideration to problems and policies of the Air Corps Six officers of the Corps testified including Maj Donald Wilson, Capt. Robert Olds, Capt K N. Walker, all of Fort Leavenworth, and Capt. Harold Lee George, Capt. Robert Webster and Capt Claire Chenault of Maxwell Field.

The testimony of these officers taken on Nov 27 terminated the formal hearings which had been held continuously since Sept. 24 The Commission then began to draft its report outlining recommendations for a broad national

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Genealogy of AVIATION

AVIATION was founded by Lester D. Gardner, the first issue appearing Aug. 1, 1916, as *Aviation and Aeronautical Engineering* In 1920 the *Aircraft Journal* was absorbed and the title became *Aviation and Aircraft Journal* to be simplified into AVIATION in January, 1922. The chief editors have been Ladislas d'Orey, W Laurence LePage, Earl D Osborn, R. Sidney Bowen, Jr., and Edward P Warner.

The present staff consists of Edward P Warner, editor (on leave of absence as vice-chairman of the Federal Aviation Commission) Leslie E Neville, managing editor S. Paul Johnston, associate editor Daniel C Sayre, assistant editor and David J Leisk, art director

policy for aviation which must be presented to Congress not later than Feb 1, next. For special legal advisory work in connection with the report, the commission retained the services of two aeronautical law experts, Col. John H. Wigmore, dean emeritus of the School of Law of Northwestern University, and Fred D. Fagg, Jr, professor of law at Northwestern Col. Wigmore is the founder of the Air Law Institute and has been actively identified with the movement to secure adoption of a uniform state aeronautical regulatory act, while Mr Fagg is the managing director of the Air Law Institute, the editor of the *Journal of Air Law*, and a member of the international technical committee of aerial law experts.

To offset rumors persistently current throughout the industry as to what the Commission's recommendations might be with respect to the Black-McKellar Bill and Postmaster General Farley's cancellation order, Chairman Howell reiterated thet the commission was primarily interested in fixing a definite policy for the future rather than in reopening old disagreements

Manufacturing looks up

A contract for 110 attack planes, the largest order for new military aircraft in peace time, was awarded to the Northrop Corporation, Inglewood, Cal., Dec. 11 by the War Department. The planes will cost $1,896,400, or $17,240 each, exclusive of engines They will have a speed well over 200 m p h., are of low wing design, all-metal construction. Engine specifications have not yet been announced

Fifty two-seater pursuit planes were also ordered by the War Department Dec 8 from Consolidated Aircraft Company Buffalo, N. Y., at a total cost of $1,996,700, each ship to cost $39,994 without engines

Three days later Consolidated received a $243 000 order for 50 Fleet trainers from the Chinese government. The contract provides for the delivery of 30 completely assembled planes and 20 planes in parts and raw materials for assembly at a new Chinese air base at Shanghai

Continuing its procurement program for the fiscal year 1935, the War Department awarded December 24 a $1,655 394 contract for 71 observation planes to the Douglas Aircraft Corporation of Santa Monica

With the 81 bombers ordered from the Glenn L. Martin Company last summer (see AVIATION, August, p 265). the Army's recent purchases of new combat types total 312, representing an expenditure of $8,723,244 Numerous training ships have also been purchased recently

Latest purchase of planes of this type was made Jan 2 when the Air Corps awarded a contract for 35 basic trainers

FIRST FLIGHT

The giant Martin seaplane (see page 11) built for Pan American Airways in its first flight tests over Chesapeake Bay. W K Ebel, assistant chief engineer of the Glenn L Martin Company and L C McCarty project engineer on the design served as pilot and co-pilot, respectively

at a cost of $754,738 to the Seversky Aircraft Corporation of Farmingdale, Long Island. They are low-wing two-place monoplanes of all-metal construction and will be powered with Wright Whirlwind 350-hp engines

The Bureau of Aeronautics has awarded a contract of $54,000 to the Sperry Gyroscope Company, Brooklyn, N Y., for directional gyros To the Hamilton Standard Propeller Company the Bureau gave a contract of $15,433 for propellers and propeller hubs

More Sikorskys for P.A.A.

Orders for four new Clipper Ships have been placed with the Sikorsky Aviation Corporation by Pan American Airways Involving an investment of slightly more than $1,000,000, the new orders are additional to the construction called for under Pan American's $3,000,000 re-equipment program started a year and a half ago Though developed from the basic design of the Brazilian Clipper and her two sister ships, the new series, technically designated as the S-42-B, will be equipped with new H series Wasps giving greater horsepower (AVIATION, October, p. 334), and with Hamilton Standard constant speed propellers (AVIATION, December, p 409) Certain improvements in the design of the planes and their auxiliary equipment are expected to increase their cruising speed substantially over that of the S-42, as well as improve their efficiency in load carrying and general operating performance They will be put into production as rapidly as final engineering details can be completed The four new ships plus the three S-42's, and the three Martin flying boats, will give Pan American a fleet of ten long-range aircraft for its major international trade routes

New equipment, new schedules

The Brazilian Clipper has been temporarily placed in regular weekly service on the Caribbean division of Pan American's West Indies route between Miami and San Juan Leaving Miami each Thursday morning, the ship makes the run to San Juan in one day instead of following the former schedule which included an overnight stop at Port au Prince This permits travelers a stopover of a half day in San Juan before leaving the following morning on the regular South American East Coast service

An experimental service is planned for early next spring over a 675-mile extension of Pacific Alaska Airways (Pan American subsidiary) from its base in Fairbanks to Whitehorse, Yukon Territory, and Juneau in the Alaskan panhandle There the service will connect with the Alaska Steamship Company, Pacific Alaskan agent in Seattle The frequency and permanence of the new schedules will depend on the volume of mail and express and passenger traffic developed It is expected that the route will be flown by a new Lockheed Electra which the company will have in operation by next spring Tentative plans under consideration include the acquisition of an airport at Juneau, as well as the installation of six ground radio stations along the route

Now flying an average of more than 20,000 miles per month, Pacific Alaska Airways is experiencing traffic demands exceeding the capacity of its equipment Heavy mail loads leave space for express and passengers so limited that the company is planning to supplement its Fairchilds and Fleetsters with additional equipment

Three Boeing 247's have been installed on Pennsylvania Airlines & Transport Company's route between Detroit and Washington, D C, and the company has taken an option on three more The engines will later be replaced by geared types. With the new equipment running time between the termini has been cut down to 3½ hours, stops being made at Cleveland, Akron, and Pittsburgh, while the cross-lake route from Detroit to Cleveland now takes only 40 minutes. The improved service makes possible better connections with other airlines serving northwest and southeast territories.

By placing Douglas transports on its New York-Chicago run, American Airlines has put its fastest of six daily schedules on a 4½-hour basis The other five schedules stop at Buffalo as well as at Detroit, make this trip in 5 hours A stewardess is carried on all flights in addition to a full complement of fourteen passengers, two pilots, mail and express The Condor sleeper plane service to Chicago via Buffalo and Detroit will continue as before, departing at 1 a.m. and arriving in Chicago at 6 10 a.m. Day Condors relieved by the new equipment have been placed in service on other routes, enabling the company to retire all its older tri-motored planes

Eastern Air Lines has augmented its night mail schedule between Chicago and Miami with a nine-hour Douglas service for passengers One round trip is made daily with stops at Louisville, Atlanta, and Jacksonville The new schedules permit close connections with United Air Lines, Northwest Airways, TWA, and Pan American.

In mid-December the planes of United Air Lines flew past the 75,000,000 mile merk Shortly before this mileage record was attained United completed its 20,000th cross-continent flight over the mid-continent route since 1927 The company is now flying at the rate of a million miles a month over 5,623 route-miles of airways Extending its Van-

couver-San Diego run, United has made Agua Caliente, Mexico, the southern terminus for its West Coast route which now covers 1,385 miles.

A 99.04 per cent performance was maintained by TWA on its coast-to-coast and New York-Chicago services for the month of November. This performance is considerably higher than that of the same month last year and was accomplished through the improvements and developments incorporated in equipment and operating technique making it feasible to fly over or around weather disturbances.

Air express service was inaugurated to and from eleven New England cities Dec. 3 when a contract signed by Boston-Maine Airways, Central-Vermont Airways and the Air division of the Railway Express Company became effective. One flight each way daily between Boston and Bangor and between Boston and Burlington will be provided. Schedules of the new service make it possible for a package sent from Portland, Maine, at 3:35 p.m. to be delivered in Portland, Oregon, the following afternoon at 5:40.

Code amendments

The National Industrial Recovery Board announced Dec. 12 approval of amendments to the Air Transport Code providing for uniformity in the 35-lb. free baggage allowance, accurate all-route information, prohibition of defamation of competitors, and restrictions on free passes. Hereafter, free passes are prohibited except for educational purposes; Federal government employees traveling on government request; persons traveling on the carrier's business, including its employees and their immediate families, its officers and directors, surgeons, physicians, and attorneys. Also permitted to travel free of charge are witnesses in connection with any legal matters in which the carrier is interested; persons injured in accidents and attendant physicians and nurses; persons with interchangeable line passes. During periods of general epidemic or other emergency these restrictions may be relaxed.

Mail matters

One additional round trip daily on six air mail routes was authorized Nov. 21 by Postmaster General Farley, increasing the annual mileage of the domestic system 3,083,520 miles at a cost of $857,813. The new trips and their operators are Chicago-Kansas City (Braniff Airways); Los Angeles-Fort Worth (American Airlines); Chicago-New Orleans (Pacific Seaboard Airlines); Fargo-Seattle (Northwest Airlines); St. Paul-Fargo (Hanford Air Lines). A temporary extension to Jacksonville of the St. Petersburg-Daytona Beach route (National Air Lines System) has been granted until the Daytona Beach airport is put in condition. While it is expected that three of the new schedules will be in operation before the first of the year, three of them are dependent upon the completion of the lighting of the airways over the routes. These are Chicago-New Orleans; Fargo-Seattle; St. Paul-Fargo. At the beginning of the new service the transcontinental schedule between Los Angeles and Fort Worth will be operated from Nashville via Cleveland to Newark. As soon as emergency landing fields and light-installation are completed between Washington and Nashville, however, the new schedule will be operated from Nashville, via Washington to Newark, giving a faster coast-to-coast schedule.

Inclusive of the service let in the original contracts, the extra schedules authorized in September (*Aviation*, Oct. p. 327), and the new schedules, the total annual scheduled mileage of the domestic air mail system is 35,120,792, its total annual cost, $9,572,413.

Long & Harmon, mail contractors on the Amarillo-Brownsville, Tex., route were notified by the Post Office Department Dec. 7 that they would be given until Jan. 1, 1935, to comply with the National Labor Board's wage scale requirements with the alternative of cancellation of their contract effective Jan. 15. The Department's action was taken in accordance with the provision of the Air Mail Act of 1934 which states that the National Labor Board's scale must be complied with and that the penalty for non-observance is cancellation of contract.

Reorganization

The provision of the Air Mail Law of 1934 which prohibits (after Dec. 31) any company whose principal business is the holding of stock in other corporations from holding stock of an air mail contractor has caused considerable re-shuffling in the financial set-up of several air lines.

General Aviation Corporation, at a meeting of its stockholders Dec. 21, proposed to dissolve and to distribute its assets among stockholders. The company's principal assets consist of 1,485,922 of the 3,435,033 shares of North American Aviation Inc., outstanding. There are 980,893½ shares of General Aviation, and for each share held stockholders would receive 1½ shares of North American stock, the small balance to be sold at public or private sale.

After distributing the North American stock, General Aviation will have remaining cash of approximately $100,000 and real estate at Dayton, Ohio, assessed at $176,504. When the latter is sold there will be a final cash distribution. Fractional shares of North American Aviation will not be issued but stockholders may make adjustments by purchasing or selling fractions on the basis of Stock Exchange quotations.

General Motors owns approximately 50 per cent of the General Aviation

NEW FASHIONS AT PARIS

A section of the Grand Palais in Paris where European manufacturers of military and commercial flying equipment exhibited their latest products at the fourteenth annual aircraft exposition Nov. 16-Dec. 2. An eye-witness account of the show will appear in an early issue of Aviation

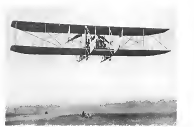
stock and in addition owns directly 8 per cent of the North American stock. After the dissolution of General Aviation, General Motors will therefore own about 30 per cent of the North American stock.

Western Air Express Corporation, holding 47.6 per cent of the outstanding stock in Transcontinental & Western Air, Inc., and TWA has declared a liquidating dividend of $2.50 a share in cash and 1⅓ shares of stock in Transcontinental & Western Air, Inc., (a new company), on each share of Western Air's capital stock outstanding. The company will however remain in existence as operator of the Salt Lake City-Los Angeles-San Diego mail, passenger, and express route which it now operates under the name of General Air Lines.

Transcontinental Air Transport, although originally an operator, became a holding company through the acquisition of 47.6 per cent of the stock of its successor operator, Transcontinental & Western Air, Inc. It must now liquidate these holdings in accordance with the provisions of the Air Mail Law, and will distribute to its stockholders a 47.6 per cent interest in Transcontinental & Western Air, Inc. The latter is to be formed by the merger of the old company of the same name with the new company, TWA, Inc., which was organized this year to bid on the temporary air mail contract from New York to Los Angeles, which it now holds, leasing the equipment of the old Transcontinental & Western Air, Inc. The new Transcontinental & Western Air, Inc., plans to apply for a listing of its shares on either the New York Stock Exchange or the New York Curb Exchange, according to a letter sent to TAT stockholders. The letter states that the principal assets of TAT are 296,825 shares of the 623,135 of Transcontinental & Western Air, Inc., and 11,908 shares of TWA, Inc. After the merger of Transcontinental & Western Air with TWA, the new company will issue 296,825 shares of its stock to TAT to be distributed to TAT stockholders of record of Dec. 28 at the ratio of two shares of the new company for each five shares of TAT.

North American Aviation Corporation owns 67 per cent of the stock of Western Air Express, and 26 per cent of the TAT stock. Under the liquidation plans of Western Air and TAT, North American will receive 40 to 50 per cent of the new T&WA, Inc., stock.

The Federal Court in Buffalo approved Dec. 7 the reorganization plan of the Glenn L. Martin Company, granting a five-year extension of the company's $2,803,500 of 6 per cent notes. The Martin company acted under the provisions of Section 77B of the National Bankruptcy Act with the consent of 93.5 per cent of its note-holders. The decision makes the company eligible for a $1,500,000 loan from the Reconstruction Finance Corporation.



STILL UP AND ABOUT

An early Wright biplane celebrates the 31st anniversary of flight Dec. 17 at Camden Airport. With Marshall Reid, one of the earliest pilots in the United States at the controls, the plane climbed to 20 ft. Throughout the country several thousand planes made a special 30-minute flight in honor of National Aviation Day

Airport developments

As a part of its campaign to make New York City the Eastern terminus of the air transport system of the country, the city's Sinking Fund Commission has approved a five-year lease, on the Glenn Curtiss Airport at North Beach, Queens. Provisions of the lease call for $1 per year rent, remission of taxes, amounting to about $28,000 yearly, and the obligation to spend at least $60,000 a year in improving the field. In addition, the city has an option to buy the property at any time during the five-year period for $1,500,000. An important feature of the airport is its large seaplane ramp which can be utilized to make connections with the new seaplane ramps on the East River at Wall Street and 31st Street and also with Floyd Bennett Field.

Proponents of the plan to have the official air mail post office transferred from Newark to Floyd Bennett were temporarily balked when J. M. Donaldson, Acting Second Assistant Postmaster General, in a letter to the Chamber of Commerce of the Rockaways, Long Island, said that the Post Office Department saw no reason to make the proposed change at present. The letter explained that the department does not designate any air mail depots as official but reserves the right to approve or disapprove those furnished by mail carriers because of the necessity of placing air mail on trains when flights are cancelled. It went on to say that Floyd Bennett would not be as satisfactory as Newark from this standpoint, and would, furthermore, increase the mileage and cost to the Department, as well as involve additional expense in establishing the facilities for handling mail already existing at Newark.

A few days later, TWA which had previously announced its intention of moving to Floyd Bennett (see AVIATION, December, p. 402) issued a statement explaining that since the transfer was contingent upon the approval of the Post Office Department, the company would remain at Newark for the present.

An extensive modernization program is now well under way at the Washington, D. C., airport. Alterations include a large addition to the administration building with a new control tower, removal of certain structures on Hoover Field across the road from the main airport, razing of concession stands, and the laying of underground telephone and telegraph lines which will effectively increase the length of the main runways. The new airship hangar being built on Hoover Field is nearing completion and will be used for the operation of a non-rigid airship for commercial flying.

The Navy Department marked the completion of a two-year Public Works program involving the expenditure of $1,000,000 by dedicating Dec. 8, its new Corry Air Field, 6 miles from the Naval Air Station at Pensacola.

New altitude attempt

On Dec. 3 Wiley Post climbed into his air-tight flying suit and aluminum helmet and took off in the Winnie Mae from Phillips Airport, Bartlesville,

Okla., determined to better the world altitude record for airplanes of 47 352 2 ft., held since last April by Lt. Renato Donati of Italy. A new supercharger had recently been installed on the Wasp engine of his standard Lockheed Vega and a special Hamilton Standard controllable pitch propeller had been added to improve the plane's altitude performance. Because the automatic exhaust valve of his suit went out of commission soon after he passed 20,000 ft, he was forced to operate it with one hand while manipulating the flying controls with the other. Hampered by his difficulties with the oxygen supply and encountering unexpected high winds, he ran short of gasoline and landed at the Army post at Muskegon, 110 miles from Bartlesville, having been in the air two hours, eleven minutes. On his own estimate he had reached 48,000 ft.

Another attempt at the record four days later was carried out without mishap. Staying aloft fifteen minutes longer than before, Post estimated that he had gone to nearly 50,000 ft. Calibration of his barographs by the Bureau of Standards, however, showed that he had failed to break the existing record on either flight. To claim a new record he would have had to exceed Donati's mark by 200 meters (656 ft.)

Pacific tragedy

The flight of Lt Charles T. P. Ulm accompanied by Co-Pilot Littlejohn and Navigator Skilling who took off from Oakland, Cal, Dec 3 for Honolulu and Australia, ended disastrously when a shortage of gasoline forced them to land in the Pacific Ocean twenty hours, ten minutes out of Oakland. Unable to report their position because overcast skies prevented celestial observations the fliers sent SOS calls for 45 minutes after landing on the water. U S Army and Navy aircraft and surface vessels from Honolulu made a thorough search for the plane (which would presumably float two days) but at the end of a week efforts were abandoned. The flight was being made in an Airspeed Envoy with 215 hp, Siddeley Lynx engines for the purpose of collecting data for a projected commercial service from Australia to the Hawaiian Islands. Lt Ulm was co-pilot with Sir Charles Kingsford-Smith on the flight from Oakland to Sydney, Australia in June, 1928, in the Fokker Southern Cross. Since the War he had been connected with commercial aviation activities in Australia

Australian mail

Air mail service between Singapore Darwin and Brisbane, last link in the much-discussed England-Australia route, was inaugurated Dec 8 when an Imperial Airways plane left London with through mail for "down-under." The schedule of twelve days to Brisbane shows a gain of twenty days over surface transport. The return service took off from Brisbane Dec 10. Mail will be dispatched weekly in each direction.

Of significance in the South Atlantic situation was KLM's first flight from the Netherlands to Curacao in Dutch Guiana, starting from Amsterdam Dec 15. The plane used was a Fokker F 18 equipped with three 525 hp Pratt & Whitney Wasps. It carried a crew of four and mails. The flight distance is 6,500 miles including a 2 300-mile hop over the Atlantic between the Cape Verde Islands and Paramaribo (Netherlands Guiana). The plans of the Royal Dutch Airlines for regular service contemplate connections with Pan American's service between the South American East Coast and the United States. Latest reports state that KLM has purchased fourteen Douglas DC-2 transports for this new service and for their European and Dutch East Indies services. These purchases were made through the Fokker Company in Amsterdam which has the European manufacturing and selling rights

An air budget for 1935 of 1,655 865-435 francs (approximately $109,287,000) was approved by the French Chamber of Deputies Nov 27. In seeking the appropriation, General Victor Denain, Minister of Aviation, announced that he was embarking on a program to decentralize the French aircraft manufacturing industry now closely grouped around Paris, as a move to render it less vulnerable to attack by enemy aircraft

Industry reports

A new aircraft manufacturing company named the Wiley Post Aircraft Corporation began operations at the Curtiss Wright Airport at Oklahoma City early in December. Chartered as a closed corporation with $100,000 stock, the company's officers include Wiley Post, president, Mark Kleedon, vice-president, and Thomas J. Ruddy, secretary-treasurer. The company will temporarily use designs and materials purchased from the Straughn Aircraft Company of Wichita.

Warren E Eaton 46, one of the foremost proponents of motorless flight in America, died Dec 1 while piloting an airplane-towed glider over Biscayne Bay near Miami, Fla. Evidence indicated that his death resulted from natural causes and that he had lost consciousness in the air. His parachute had not been opened and the ship, landing in trees, was undamaged. A pilot of the 103d Pursuit Squadron during the World War, Mr Eaton had operated the Central New York Airways at Norwich, N. Y., since 1926. As president of the Soaring Society of America since its organization in 1932 he gave generously of his time, ability and means to advance the art of motorless flight. The annual meets at Elmira, N. Y., were carried on under his able direction, and he had been instrumental in establishing the new soaring site at Big Meadows, Va. At the time of his death he was engaged in starting a school for motorless flight in Miami

A military funeral with full honors at Arlington Cemetery in Washington, D. C., was accorded Nov. 10 to Lt. Col Horace M. Hickham one of the foremost flying officers of the Air Corps and commanding officer of the 3d Attack Group at Fort Crockett, Tex who was killed there Nov. 5 as his attack plane nosed over while making a landing. A graduate of virtually all of the official military institutions including the War College. Colonel Hickham had been actively connected with the air arm of the service since 1917 when he was assigned to the Aviation Section of the Signal Corps. During the War he commanded the Air Service Pursuit School at Carlstrom, Fla., and the Aerial Gunnery School at Dorr Field, Fla. He later served as Chief of the Information Division, office of the Chief of Air Corps, as Assistant Commandant of the Advanced Flying School, and as Chief of the War Plans division of the General Staff

Rear Adm. John Halligan, Jr., U.S. Navy, commander of the Thirteenth Naval District and the Puget Sound Navy Yard died Dec. 11 at the age of 58. A firm believer in the utility of aircraft as a complement to the fleet, Admiral Halligan qualified as a naval aviation observer at the Pensacola Air Station in 1928. He commanded the aircraft carrier Saratoga from September, 1928, to April, 1929, when he was appointed Commander, Aircraft Squadrons, Scouting Fleet. He assumed the duties as Commander Aircraft Squadrons, Scouting Force in 1932 and the next year, after the reorganization of the Naval aeronautical forces, became Commander Aircraft, Base Force.

AVIATION PEOPLE

CHANGES in the executive organization of the Glenn L. Martin Company make Lessiter C Milburn vice-president and assistant general manager and B C Boulton chief engineer. Twelve of Mr Milburn's sixteen years with the company have been as vice-president in charge of engineering. Mr Boulton came with the company in 1930, after having served at Wright Field until 1924, and later as chief engineer of the Loening Company. He was a member of the Martin project engineering staff during the development of the bomber. As in the past, Glenn L. Martin will continue as president and general manager

L C Milburn

B. C. Boulton

• The Air Line Pilots Association has elected the following officers for a two-year term: President, David L. Behncke, vice-presidents, Los Angeles, James Ingram; Newark, Duncan McAllum; Minneapolis and St Paul, R L Smith; Salt Lake City, Ralph J Johnson; Fort Worth and Dallas, Tom Hardin, Kansas City, Vernon Powers; Atlanta, Frank Andre, Brownsville, Audrey Durst; Miami, Roy Keeler. Homer F Cole is secretary, and Harold L Knoop treasurer

P M Fraser

• Following the death of W. E. Thomas, Palmer Nicholls, since 1927 vice-president and general manager of Pacific Airmotive, Inc., becomes its president. Mr Nicholls, a pilot, and identified with aviation since 1919 will carry forward the expansion program planned by the company

T. F. Hamilton

• Invitation to deliver the 1935 Wilbur Wright Memorial Lecture before the Royal Aeronautic Society in London in May has been accepted by Donald W. Douglas, longtime airplane designer, now president of the Douglas Company. Every other year the honor of presenting the lecture is tendered to an outstanding figure in American aeronautics. Last year Prof B Melvill Jones of Cambridge University presented a paper on analysis of stalling characteristics.

• Peter M. Fraser and Thomas F. Hamilton have been added to the directorate of United Aircraft Corporation. Mr Fraser has been connected with the Connecticut Mutual Life Insurance Company of Hartford since 1906 and is president of the Life Underwriters' Association of New York City. Mr Hamilton established his own plane and propeller manufacturing concerns after the War, both of which were acquired by United Aircraft & Transport Corporation in 1929. He served as chairman of the board of Hamilton Standard Corporation, later as president of United Airports of California, is now the European representative of United Aircraft Exports Corporation.

• Pan American Airways System's new international ticket office in Chicago is in charge of Charles Larrabee, formerly of the New York office

• Chief personal news to emerge from the recent realignment of TWA and Transcontinental & Western Air, Inc., interests, is that Jack Frye formerly vice-president of TWA Inc has been made president of Transcontinental & Western Air Inc. The latter is the new company which was formed to comply with the provisions of the new air mail requirements. The other officers remain as in the TWA, Inc., set up

• The Stearman Aircraft Company of Wichita, Kan., a unit of the Boeing Airplane Company, has re-elected J E Schaefer president, and MacShort vice-president in charge of engineering. Cliff Barron is secretary-treasurer.

• Reorganization of the traffic department of United Air Lines, following resignation of K A Kennedy, former traffic manager, places Harold Crary, director of public relations, in charge of all advertising publicity, and traffic. Under the new plan, traffic activities are being directed under Mr Crary's supervision by B B Gragg, formerly district traffic manager at Cleveland, and R W Ireland, formerly assistant to the general traffic manager

• Paul Wright has been appointed assistant to W. A. Patterson president of United Air Lines. Mr. Wright was formerly assistant to L B Manning, president of American Air Lines

• Capt Theodore J. Koenig, Buffalo, N Y, on duty in the office of the chief of air corps, has been detailed as Assistant Military Attaché for Air to the United States Diplomatic Missions in Germany, The Netherlands, Denmark and Sweden

• Vincent Bendix, president of Bendix Aviation Corporation, Charles Marcus, president of Eclipse Aviation Corporation, and W A Reichel, chief engineer and general sales manager of Pioneer Instrument Company, have completed a two-months' trade tour of Europe, including the U S S R.

• Pennsylvania Airlines & Transport Company has appointed Donald A Duff divisional traffic manager in charge of the western division, with headquarters at Detroit. He will supervise the passenger, mail and express services between Detroit and Milwaukee.

• Chance Vought Corporation has elected James Gaffney secretary-treasurer of the company, Thomas Conlan assistant secretary, and Joseph Barr assistant treasurer. Joseph L McLane, factory manager, becomes a director

• Promotions in the traffic department of Eastern Air Lines have been announced as follows: John K Ottley, Jr., from Atlanta to New York as assistant general traffic manager; E. E Skinner, Northern division traffic manager with headquarters in New York and Sam D Wilkes, Southern division traffic manager with headquarters in Atlanta

FLYING SERVICES *and* SCHOOLS

REPRESENTATIVES of college flying clubs at a conference in Washington, called by the National Aeronautic Association December 8 drew up a program designed to stimulate flight training among undergraduates Features annual intercollegiate meet during the last week in June, annual college club conference to be held in Washington in the spring, formation of an undergraduate committee to work in cooperation with the NAA in encouraging college aviation activity, formation of a national organization committee to apply for a charter for a National Intercollegiate Flying Clubs Chapter similar to the National Racing Pilots Chapter Colonel Harry H. Blee, chairman of the Committee of Civil Aeronautics of the NAA, presided.

As a feature of the Washington conference, the Loening Trophy for 1933-4 was awarded to the University of Minnesota Flying Club, with a total of 425 hours flown during the school year. The presentation was made by Edward P. Warner, NAA Governor for New York William and Mary Flight Club won second place, while Dartmouth and Harvard received honorary mention.

• The contract for overhauling the engines of Department of Commerce planes based in the New England district has been awarded to Ames-Skyways at the East Boston Airport. Included in the contract are Kinner, Wright, Pratt & Whitney, and Warner engines, while the Lycomings and Jacobs owned by the Department will be maintained elsewhere.

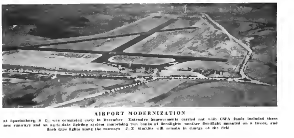
• The National Recovery Administration made two announcements November 20 of interest to the commercial aviation industry The first allowed members of the industry until December 26 to register with the National Code Authority, an extension of 45 days over the original deadline. The other allowed the Code Authority until Feb 1, 1935 to submit for NRA approval a proposal for adjustment of wages above the minimum

• Sponsored by the Michigan Board of Aeronautics as part of the Federal Relief Administration's Education Program, ground schools for aeronautical training are being established in the larger cities of the state Fifteen applications have already been approved while 25 more are pending, and it is estimated that there will be over 1,000 students enrolled by the first of the year

• A joint Aviation Co-ordinating Committee for Arkansas, having as its purpose the promotion of interest in civil aeronautics, has been selected by the National Joint Committee. Members of the Arkansas State Committee are Cecil E. West, representing the Aeronautical Chamber of Commerce of the United States, Fred N Rix, Hot Springs, representative of the Independent Aviation Operators of the United States, Felix G Smart, Pine Bluff, representative of the National Aeronautical Association; Charles M Taylor and Capt. C. W Holderbaum of Little Rock, representing state aviation officials

• A recent report from the Ryan School of Aeronautics indicates that the school now has one of the heaviest enrollments in its history The roster includes representatives from seven foreign countries in addition to students from practically every section of the United States. The majority of the new enrollments are for the complete transport pilot's flying course which the school offers as a standard part of its curriculum, and which includes radio-beam and instrument flying, night flying, amphibian training, and 2,500 miles of extensive cross-country experience

• Twenty-three recent graduates of the Boeing School of Aeronautics have been employed in various capacities in the industry within the past few weeks Harry Bingham goes to Ryan Aircraft Company at Santa Monica as test-pilot Heath McDowell is Chief Engineer of the Bowlus Sailplane Company at Wilmington On United Air Lines' metals shop roster at Cheyenne are Everett Lamp, Thomas Downs Reno Bottarini, John Simon, James Olney, Elwyn Deu, Harold Kofahl, John Jussila, Lewis Long, Philip Gaylord, Laurence Martin, John Kline, and William Ottenstein Also with United at Cheyenne are Richard McBrien and K S Van Trump in the instruments department Ralph Koza and G A Gray on the engine crew, and Henry Wheelwright in the airplane repair shop Merrill Marion has a radio job with United at Salt Lake City, and Arthur Kidder is working for the same company at Bakersfield Waldo W Eaton is with the Bureau of Air Commerce.



AIRPORT MODERNIZATION

at Spartanburg, S C was completed early in December Extensive improvements carried out with CWA funds included three new runways and an up-to-date lighting system comprising two banks of floodlights another floodlight mounted on a tower, and flush type lights along the runways J E Simkins will remain in charge of the field

SIDE SLIPS

WE WERE solicited recently, probably with no too great hopes on the part of the Editor, for suggestions for a name for the new department that makes its first appearance in this month's issue, the one with the answers to the Editor's queries on the onerous problems of the local operator The best we could do, after rejecting "Angels Beware" and "Advice for the Air-Worn" on our own hook, was "Speaking of Operations," which we weren't too proud of, but at least it couldn't have been half so bad as the Editor said it was

SPEAKING of names, all this assuming of company aliases that has been going on in the industry, since Dr Farley started issuing ukases, puts us in mind of a story of our childhood which was spent in a thriving Middle-Western metropolis of not too great proportions On the main street of the city was a combination candy store and food shop which might have been named today "Ye Sweete Shoppe" or "The Sugar Bowl" But that was in another decade and for years it had driven a thriving trade under the title of "The Busy Bee" Came a time then when aging decorations and a desire for more space led to a complete renovation of the "hive," as we young people used to call it, with a new front, new fountains, and even the replacement of the ageless wedding cake in the window with a bigger and cleaner model To publicize the opening of the new quarters, the management announced that it would award a $1,000 prize for the best suggestion for a new name, received before such and such a date The response was tremendous For weeks the postman handling the Busy Bee mail staggered to its door under groaning sacks of hopeful and no doubt brilliant suggestions A full half the population of the town must have laid tentative plans for disposing of that thousand for Pope Toledo automobiles, Edison phonographs, or new lace curtains for the parlor Finally, to the infinite relief of the postman, the deadline for entries drew past, and the judges sat down to their deliberations On the day they were to announce their decision papers sold like extras on election night And sure enough there was the announcement right on the second page, "The Busy Bee management takes pleasure in announcing that Mr John M Doaks of Iuka Avenue this city, has been awarded the $1,000 gold prize in our title contest Mr Doak's winning title which will hereafter grace the front of our new store at High and Gay Street is 'The New Busy Bee.'"

AND AT THAT it may serve as a suggestion for that organization which we still call TWA around this office. Our news department this month carries an ambitious attempt to follow it from the union of Transcontinental Air Transport with Western Air Express Corporation into Transcontinental & Western Air, Inc., down through Transcontinental & Western Air, Inc, General Airlines, and TWA, Inc back in some way toward Transcontinental & Western Air, Inc, and Transcontinental Air Transport Corporation But we can't follow it Instead we intend to call it The New TWA and let it go at that

ONE other thing we want to work off our mind before we settle down to our quota of epoch-making events for the new year, and that is this intense enthusiasm for anything aeronautical reported from our worker comrades in Russia Any nation which can build up a fleet of three thousand military airplanes and a fine network of airlines in a few years' time is certainly of considerable aeronautical importance, but if it can also go no less than completely screwy over stratosphere ballooning and gliding, and take up parachute jumping as a national sport while it is doing so, it deserves watching as a place where this industry may start going places

THIS parachute jumping especially intrigues us Everybody seems to get in on it, men, women, children, old moujiks, and curvesome movie stars We have seen news photos of a mass drop by an entire jazz band, minus of course the piano player, all playing madly on their instruments as they fall earthward New airplane designs have their load capacities expressed not only in kilogrammes, but also and more popularly in the Russian mind, in the number of parachute jumpers that it can stagger off with There seems to be an increasing vogue for fancy chutes, too, some we have seen in newsreels being made up in several colors, like those fancy under-pants for gents you catch sight of in locker rooms nowadays

RETURNED travellers tell us that opportunities to jump are awarded to those whose work records are exceptional For the proletarian proletariat there are astounding devices in the Rest and Culture Centers, (Coney Island amusement parks to you) in which the relaxing tovarish can for a few kopeks put on a belt attached to elastic cords and jump from a platform, thereby experiencing the same delightful sensation that a real jumper gets from the pull up of an opening chute

A RACE that can enjoy such a feature of aviation, we say can't be checked But if they call that fun they are overlooking a lot of other fine opportunities. We offer the suggestion of an apparatus to simulate mild forced landings, consisting simply of a chair in which the thrill seeker sits and an instrument board full of protuberances which swings up and hits him soundly in the nose Then, too, they could get the sensations of outside looping by simply strapping themselves upside down to the cars of one of these Giant Whirls that can be found in any Rest and Culture Center Or finally, though we could go on for hours, we must offer an idea for a machine which we call A Device-For-Recapturing-the-Pleasures-of-Cranking-a-Cold-OX5 It consists of a sort of rowing machine with a horizontal axis that can be tightened until the comrade can just pull it through, and a following arm which will sock him roundly in the head if he is just the slightest bit slow in his ducking By the side of it is placed a phonograph which repeats over and over the Russian equivalent of "contact" and "switch is off" just as indistinctly and albeit as inaccurately as you used to get them from those eager farm boys that try to be so helpful to stray aviators

FLYING EQUIPMENT

Series E Hornet

RATED at 750 hp at 7,000 ft. under A.T.C. No 136, Pratt & Whitney's latest Hornet—the S1E (first of a new E Series) ranks as the most powerful single row radial air cooled engine so far produced. Its general characteristics may be traced through a long and honorable ancestry, but it steps ahead of its immediate predecessors by virtue of the same improvements in engineering and design that were introduced when its first cousin—the S1 H1 Wasp—made its bow to aeronautical society some three months ago (AVIATION, October, 1934).

In discussing the H Series Wasps we described the new system of automatic valve gear lubrication, but were unable to illustrate it diagrammatically at that time. That deficiency has been remedied, however, and the accompanying cross-section of a typical valve operating assembly applies to both engines. Oil under pressure is fed to the distributing groove (A) machined in the nose section of the crank case, passes through metering ports (B) in the tappet mechanism and up the hollow push rod to the rocker arm. It is distributed through holes in the rocker to the ball bearings and thence to the end of the valve stem. After serving its purpose it falls into a small sump in the rocker box, from which it is returned either to the crank case by gravity through the push rod cover tubes, or through a newly designed scavenging ring to a chamber in the main sump from where it is pumped back to the oil tank. No excess oil is permitted to collect in the rocker boxes either in flight or after the engine is shut down, making for normal valve action at all times, and for easy starting in cold weather. The addition of the valve lubricating device to both Hornet and Wasp has eliminated much of the trouble and expense formerly required by frequent rocker box lubrication and inspection.

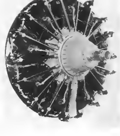
Hornet E is fitted with an automatic oil temperature control that reduces warm-up time materially, maintains oil at 68 deg. C. at all times without manual control by the pilot. When the engine is cold, a thermostatically controlled selector valve acts to direct warm oil coming back from the sump into the bottom of the tank near the suction line—consequently warm oil is immediately recirculated. As the temperature of the whole oil supply rises to the desired operating limit, a part of the oil is by-passed through a cooler on top of the tank, and the suction line begins to draw from the main body of the oil in the tank.

Cylinder construction, though similar to older models has been improved by the use of stronger materials, closer fin spacing, and the application of close fitting quick removable pressure baffling. Baffles are arranged so that individual cylinders may be removed without disturbing adjacent baffles. Valve inserts are of austenitic steel, shrunk in. Exhaust valves are faced with stellite, sodium cooled.

The shelf-mounted cam design worked out for the H Wasps has been applied to the valve gear to operate safely at higher speeds. This arrangement reduces the angularity of push-rods, makes possible an outboard bearing for the cam drive gear, stiffens up the crank case.

The crankshaft is of the two-piece type, split in the center of the journal to add strength and stiffness to the junction of pin and rear crank face. The rear half telescopes into the front half. The number of splines at the coupling has been materially increased. Roller bearings carrying the shaft have been crowned slightly to avoid crushing the races at the edges of the rollers. The reduction gear has been simplified, and improvement in manufacturing precision has made possible the elimination of the equalizing mechanism without sacrifice of reliability.

Other changes include automatic priming built into the carburetor and operated by means of throttle and mixture controls, precision ball bearings, outboard mountings, on intermediate supercharger drive train, revised diffuser for better fuel distribution; mounting of automatic propeller pitch control valve on rear face of oil sump to simplify control hook-up; more compact hot-spot with stainless steel heater tube, special attention to oil-tight integrity of entire engine. Specifications include: Rating, 750 hp at 7,000 ft., propeller gear ratio, 3:2, compression ratio, 6.5:1; blower gear ratio 12:1, overall diameter, 54⅞ in.; overall length, 51 in.; bare weight, 1,005 lb.



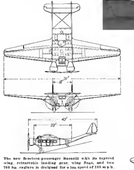
Hornet S1E-G rated 750 hp at 7,000 ft. Above: Details of automatic rocker box lubricating system now standard for Hornet E and Wasp H Models

Model I Bunting

DESIGNED by the faculty and students of the Curtiss-Wright Technical Institute of Aeronautics at

Grand Central Air Terminal in Glendale, Cal., and now being built by the students under faculty supervision, the Bunting, Model 1, a single place, high wing monoplane, will be ready for test flights in the near future. It has a wing spread of 24 ft. an overall length of 17 ft. and a height of 6 ft. 2 in. Its gross weight is 600 lb., wing area, 73 sq.ft., wheel tread 5 ft. 6 in. A 36-hp Aeronca engine will be installed.

The airplane will be fabric covered except the nose which will have a metal cone. Welded tubular construction has been employed for the fuselage while the wings have wooden spars and ribs. The wheels are equipped with streamline cowlings. Total actual cost has not yet been computed. The estimated cost of materials, exclusive of engine, is under $500.



The new fourteen-passenger Burnelli with its tapered wing, retractable landing gear, wing flaps, and two 700 hp. engines is designed for a top speed of 200 m.p.h. at 10,000 ft.

Taper-Wing Burnelli

THE Uppercu-Burnelli Corporation of Keyport, N. J., has a new model to be known as the UB-14, nearing completion in its shops. Retaining the characteristic Burnelli feature of a wide cabin of airfoil shape, it also incorporates in its design many of the more common refinements of modern transport design.

The high externally braced monoplane wing is markedly tapered in both plan and thickness and is equipped with large hydraulically operated flaps. The landing gear, also hydraulically actuated, retracts fully into the fuselage in flight. The tail structure, boom mounted, has been substantially simplified from that used in previous Burnelli models.

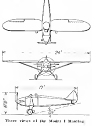
The cabin, which is of course exceptionally roomy, is designed to carry fourteen passengers and 800 lb. of mail, baggage, or express, or otherwise accommodate a total payload of 3,200 lb. with very wide tolerances of size and shape.

The fuselage structure is of the flat-stressed - dural - skin over-extruded - dural-section - framework type with fittings, engine mounts, and landing gear of heat treated chrome molybdenum steel.

The power plant consists of two 700-hp engines mounted at the two forward corners of the cabin. They are fully cowled and their mounts fair nicely into the cabin contours. Their nearness to the center line constitutes one of the most important Burnelli features, since it results in a high degree of single engine effectiveness in case of failure of one motor. This is further increased by the fact that the thrust lines of each engine is directed slightly inwards, another typical Burnelli feature.

The weight empty is 8,000 lb., with full load 14,000 lb. Performance estimates based on extensive wind tunnel tests call for a top speed of 210 m.p.h. at sea level, 225 m.p.h. at 10,000 ft., landings with full load at 63 m.p.h.

The Cunningham-Hall GA-21M is equipped with an improved and automatic version of the Cunningham-Hall High-Lift wing. Its clean lines and metal monocoque construction present a marked contrast to the Guggenheim Safe Aircraft Competition entry from which it is derived



Three views of the Model I Bunting

Cunningham-Hall GA-21M

IT HAS been frequently lamented, during the years that have intervened since the Guggenheim Safe Aircraft completion of 1929, that none of the aerodynamic advances which featured several of the competing designs have subsequently appeared in commercial production.

It now seems certain that one of the most interesting of the lot is to be finally forthcoming, for the Cunningham Hall Aircraft Corporation of Rochester New York have announced the completion of a two place side-by-side sport and training plane equipped with the Cunningham-Hall high lift wing and powered with the 145 hp. Warner Super Scarab.

The fuselage is of aluminum alloy monocoque construction. The wings are all metal in structure with combination fabric and metal covering while the covering of control surfaces and flaps are entirely of fabric.

The ship has been completely stream-

lined. The engine is fully cowled The wheels of the landing gear withdraw from the slipstream into large individual fairings which also cover the queen posts of the external bracing for the low monoplane wing.

The exact details of the present High-Lift wing are not yet available but it has been announced as automatic in action and is probably similar to the earlier type used on the Guggenheim Contest ship In that model the wing has a regular Clark Y wing section in normal flight When an increase of lift is desired a shutter opens in the under surface just aft of the forward spar permitting air to flow over the top of a smaller wing built inside the main wing section and forming the lower contour of it from the shutter back to the trailing edge. From a point corresponding to the normal location of a rear spar to the trailing edge the inner wing consists of a flap that depresses far enough to substantially increase the effective camber.

The new Douglas Dolphin amphibian has a top speed 25 m.p.h. over that of previous models and a quieter, more comfortable cabin.

Model 6 Dolphin

DETAIL improvements in cabin and control design and higher top and cruising speeds distinguish the latest model of the Douglas 113 Amphibion from its predecessors Former amphibion models, equipped with twin SC-1 Wasps, have had top speeds of 154 m.p.h at 6,000 ft. and cruised at 140 m.p.h Model 6, with its S1D1's, reaches 170 m.p.h at 5,000 ft, cruises at 150 m.p.h.

Several of the cabin refinements developed for the Douglas transport have been utilized The interior noise level has been substantially reduced by wall insulation and the elimination of leaks, three individually operated inlets and one exhaust duct provide amplified ventilation, while the heating system is of the latest exhaust-line steam boiler type

Externally, little has been modified. The stabilizer adjusting mechanism has been replaced by a tab mounted at the trailing edge of the elevator The landing gear struts are of a new combination air and oil type Propellers are three-bladed and of controllable pitch.

Grumman Fighter

ALTHOUGH full data on the Grumman two-seat fighter SF-1 have not yet been released, official Navy photographs now available reveal several structural features which appear to be similar to those of the Grumman JF-1 and JF-2 described in December AVIATION The fuselage is of stressed smooth skin monocoque type, the wings of fabric covered metal The fuel tanks and the housings for the retracted landing gear are placed in the exceptionally deep fuselage The SF-1 is powered with the Wright Cyclone mounts emergency flotation gear and carries deck arresting equipment

The Grumman two-seat fighter SF-1 showing features of retractable landing gear, coupe cockpit shelter and ring cowling on the Cyclone engine.

Security Seaplane

AN Approved Type Certificate has been recently granted the Security National Aircraft Corporation of Van Nuys, Cal, for its Security Airster as a twin float seaplane All the landplane features including folding wings, side-by side seating, and 100 hp Kinner engine, have been retained The floats are Edo Model 1835s equipped with water rudders The low wing arrangement with its relatively low center of gravity makes for exceptionally good handling on the water

After passing Bureau of Air Commerce tests for a seaplane A.T.C. at College Point Long Island, this Security Airster mounted on Edo floats was exported to Oslo Norway for the use of Security Aircraft's Scandinavian dealer.

AIRCRAFT AT WORK

Extending the Giro

MOST operators who have utilized autogiro equipment in their activities have done so as a side line to their airplane operations Giro Sales and Service, Inc of Roosevelt Field was organized from the outset for the single purpose of developing the commercial possibilities of rotor sustained aircraft After three and a half years of operations they have achieved an importance in autogiro affairs second only to that occupied by the two active giro factories In that period they have sold six ships, had a steady business in storage, repair, and refitting of privately owned giros, and have operated their own some 2,000 hours without damage in demonstration, training and sign-towing work

Though their sign towing has accounted for but a third of their total flying, it has formed the most important of their business almost from its beginning. Holding the rights for the greater New York area to use the patented Kellet vertical signs, they have advertised more different types of products than could be listed here. Bost Tooth Paste, Ward Shoes, Atlantic Gasoline Golden and King's Beer and Ford Motors will serve as samples Their first job was to publicize "Strange Interlude" which they did with a deal of dramatic effect on the day of the solar eclipse in the summer of 1933 They helped elect LaGuardia, Mayor of New York by towing a "Vote Fusionist" sign and have been used in other political contests Their most famous stunt was their appearance over the Yale Princeton football game last fall trailing a banner "Send Your Son to Harvard," a bona fide paying transaction incidentally

Of recent months the company has been devoting most of its energy to experiments and demonstrations of dusting and spraying from their giros, and next season will undoubtedly see them extensively engaged in such operations They have found the giro to possess a number of advantages for this work It can operate out of small fields close to the project It can fly slowly over the area being dusted, insuring even coverage and permitting the pilot to inspect the effectiveness of his work It is capable of maneuvers and steep climbs necessary to avoid obstacles Forced landings are infinitely less hazardous than in airplanes operating under the same conditions And finally the downwash from the rotor blades has the very desirable effect of mixing and circulating the insecticidal cloud

To render the spray even more effective, Yates Satterlee, co-manager of the company with Leslie Cooper, has invented and patented a rotary diffuser which effectively atomizes any liquid as it is discharged from a tank in the fuselage By its use the cloud is given an extremely slow yet internally active descent resulting in adhesion of the insecticide to the lower as well as the upper sides of leaves and stems So strong has been the interest taken in their work by the Department of Agriculture, by mosquito control boards of several localities, and by tree specialists, both autogiro manufacturers have proceeded with the study of craft designed particularly for spraying and dusting operations.

Dogs and sled go for some foot mushing.

Northern Trails

The freight loads carried by airplanes in northern Canada and Alaska have become proverbial throughout the industry for their ruggedness and variety More graphic than most reports on this topic is the following story sent us by Edward Green of Varsity View, Manitoba, about the activities to the north of his district.—Ed

THERE are not many, who realize exactly the nature of freight being carried by planes in the far north People are still prone to associate airplane freight with fragile packages laden with ostrich feathers, movie film, or the like They might be considerably shocked to know that airplanes operating in the northern mining districts carry as much as 3,000 lb of high grade ore out to the smelters on a single flight The return trip may see the cabin of the plane loaded with rolls of barbed wire, bales of hay, diamond drill equipment, gasoline drums, dog teams an entire winter's food supply for a trapper "going in" or even pigs There is no limit to the amount or type of freight handled On one northern run, boxes of whitefish are hurried out to catch the express for New York and Chicago markets.

Ingoing freight is not always carried from the railhead by airplane There are many chains of lakes and rivers which make waterways freighting comparatively cheap for part of the journey But there are usually limits beyond which it would be impossible to get supplies in under two to three months, and in many cases deliveries must wait for the freeze-up when lakes, rivers and muskegs are passable for dog teams, or "cat" trains At these "jumping off places" airplane bases are established A bay selected for its sheltered shores and a small dock completes a northern air base Not much, surely, but enough to serve the purpose

Machine units up to 5,000 lb in weight have been carried from these improvised air bases and it is interesting to note that in twelve days of flying by one plane, 75 217 lb of ore were carried over an otherwise impassable stretch of country 45 miles in width In one day this plane carried a total of 14,350 lb of cargo

Costs of such freighting by air are high as viewed by the city dweller but dirt cheap to the habitants of the frozen lands In some places the cost of transporting 1 ton of freight to a trading post or a new mine will run as high as $250 Gasoline was selling at one time in Red Lake for $2 50 per gallon. Airplane transportation has lowered these costs and a passenger fare of 25 cents per mile is a fair average About ⅛ cent per pound-mile is a fair idea of freight costs.

OPERATOR'S CORNER

An exchange of ideas on the problems of the commercial aviation industry

QUESTION 1. Is the one-dollar airplane ride a money maker or a last resort to get business at any price? Can it be made profitable with ships of moderate seating capacity, considering the large number of landings and take-offs in such operation? How long a ride can be given for one dollar with fair assurance of profit? Would it be preferable to charge a higher price making it possible to fly over some point of interest? Is there any advantage in flying passengers for one dollar to keep equipment moving and attract onlookers for longer rides?

Ruins Long-Ride Business

THE one-dollar ride is certainly not a money maker and so must be in the "last resort" category. It cannot be made profitable with ships of moderate seating capacity, considering the large number of landings and take offs in such operation. About the shortest ride that is either fair to the customer or profitable from the point of loading and taxiing time is about five or six minutes. This gives an opportunity for climbing to a decent altitude, giving the customer (who is usually a first rider on short hops) a chance to collect himself and see something. A shorter ride means simply a take-off and half circle of the airport at a minimum altitude. With passengers buying tickets well and filling both seats in a two-place plane, about six trips an hour is a good average, considering loading, taxiing into position, a five or six-minute flight, taxiing back to the loading point and discharging passengers. Two passengers at one dollar each for six trips produce a gross of $12. With ticket salesman's commission, airport concession charge, pilot, storage, proper insurance, depreciation, maintenance, gas and oil, to say nothing of supervision, it is impossible to operate a two passenger plane, or any other for that matter, profitably for $12 per hour gross. Twenty dollars per hour would just about get one by. Assuming full loads, a larger capacity plane brings down the cost per capita, but when proper cost factors are used it is my opinion that no short haul operation can be carried on for one dollar per passenger.

Higher price tickets frequently can be sold when a particular point of interest can be advertised, as this appeals to "repeaters." It gives an objective to the trip and, with several such points, the same customer can be induced to take the trip at various times when he would not be interested in flying simply for the sake of flying. It is seldom good business to do business at a loss, and the very fact that you give a five-minute ride for one dollar keeps you from charging a profitable rate for the longer ride. The greatest proportion of your hopping business, even when special alternate rides are offered, is the cheapest. Assuming the longer rides at a profitable price, it seems questionable judgment to sell most of your goods at a loss to sell a small percentage at a profit. The large department store can feature a leader, even at a loss, because that leader will account for only a fraction of the day's business.—GEORGE W. ORR, *president, Roosevelt Field, Inc., Mineola, N. Y.*

A Manufacturer's Opinion

WE BELIEVE a five-minute ride in one of our ships, the Taylor "Cub," would be very profitable if the ship is kept busy. By a five-minute ride, we mean a trip which includes take off, landing and loading another passenger.

We believe that a price higher than this would discourage quantity hops. We also believe that people who can spend more will take longer rides. In fact, we have experimented here at our own port and advertised 50 cent rides to children under sixteen years of age and found that the young people would get in line for rides. We carried 60 passengers the first afternoon in 2½ hours. We have also tried carrying two children at 25 cents a piece, placing one in the front seat with a safety belt on and another child in his lap with a safety belt around him also. The children surely do come out and ride at the 25 cent and 50 cent prices and it is profitable. They also bring along their parents who take regular priced rides.—TED WELD, *sales manager, Taylor Aircraft Company, Bradford, Pa.*

Promotes Long-Ride Business

ONE-DOLLAR RIDES are money makers if the right equipment is used and the field or ground is not too rough on ships. The one essential factor is that ships with good take-off, slow landing, speed, and low gas consumption must be used. Our rides average only five minutes and the equipment used are Kinner Birds and Ryan five-place ships which are very economical.

We have found that charging $1.50 has held ships down on ground a good deal and when $1 rides were announced the ships were immediately busy. We found that these rides have induced people to come back and take a longer ride inasmuch as the first was only a teaser.—FRED W. WAHL, *president, Mountain Airways Corporation, Laramie, Wyo.*

Must Keep Crowds Moving

DOLLAR RIDES are only worth while when you can get the crowd riding and can keep one flight following right after the landing of the previous one. It is essential to load passengers satisfactorily and the loading position should be such that very little time is wasted in taxiing. This can usually be done on most small and uncongested airports by making a crosswind landing and then a crosswind take-off, ending the landing run at the pick up position and having the take off point close to the same spot. The condition of the surface of the field is important because of wear and tear on the airplane due to a large number of landings and take-offs. If the surface is fairly good, if the ships will get off quickly and land shortly, money can be made at this figure even with ships of moderate seating capacity, say two passengers. If the elapsed time from one take-off to the next is five minutes, that means twelve flights per hour at a dollar a head, or an income of $24 an hour—a very handsome profit. I have run 50-cent rides when taxiing conditions have been favorable and believe that I have broken even as the ship is only in the air or under full power about three minutes out of every flight. It would be preferable to charge a higher price making it possible to fly over some point of interest, but unfortunately it seems hard to persuade the public to take such flights and I have found that unless you fly them for a dollar, you will not fly any at all.

If you can get a line of waiting passengers it is quite easy to sell more rides, but once your operations slow down and you have no one waiting it is very hard to get the ball rolling again.—JOSHUA CRANE, JR., *president, Waco Sales of New England, Inc., Boston, Mass.*

Long Rides Go to Airlines

THE dollar ride is a very desperate effort of the pilots and plane owners to "eat" while things are so slow. It will not show a profit. Three-place planes show a loss (too many landings). Over eight place planes would show a loss because of no volume of business over a period of days. Five-seven place planes averaging over four passengers per trip would net about 10 per cent. Not over three minutes can be given with the shortest possible taxiing time. Two dollars each and three tickets for $5 would permit a seven-minute ride with profit. This permits the pilot to vary his route for second riders.

It is better to move the plane with the higher priced ticket and with less passengers per trip than to cut the price. If longer rides are taken the airliners of the regular passenger lines will get the business. The short ride or taxi plane cannot compete in price with the established airline companies over cross country routes.—ROGER Q. WILLIAMS, *Roger Q. Williams Aviation Corporation, Brooklyn, N. Y.*

In the above the writer has only considered the taxi planes operating at regular airports with the planes and passengers fully covered by insurance and the planes in A-1 condition not the "gypsy" or "barnstormer" drifting from field to field.

Exit Dollar Hop

THE SOONER the small operator applies the axe to the dollar hop the sooner he is going to sing "We're in the Money" and mean it. How many times do the dollar hoppers come back? The answer is never unless there isn't another airport within a hundred miles. The only solution to the equipment problem is the six-place cabin monoplane, an eight place twin-motored plane or one of the inexpensive tri-motors that are for sale. Nearly every airport is so situated that within a 30 to 40 mile radius there are several aerial sightseeing trips of interest that can be made at prices ranging from $2 to $3.50 per head. Equipped with a large cabin plane that can carry five to ten pay passengers the operator is ready for business. He very carefully plans out four or five different trips and prints circulars describing the trips. It is not an impossible feat to sell a small speaker system in the plane so that the pilot can describe the flight to the passengers at various points.

Once introduced to the aerial rubberneck flight to interesting historical or other points, the passengers are prospects for the other three or four flights and will by word of mouth advertise your business amongst their own friends. Bystanders on the ground will not be able to follow the plane throughout its entire flight and they will be desirous of finding out where the plane goes when it is out of sight. The only way to satisfy their curiosity is for them to make one or more of the various trips which creates customers. It is obviously impossible to pay the top price which manufacturers ask for large cabin planes and engage in any such business and make it a financial success, but there are plenty of good used large cabin planes going begging today that are capable of such work for years to come.—ROBERT C. STONE, *Framingham Airport, Framingham, Mass.*

Keeps Equipment Busy

ONE-DOLLAR airplane rides represent the lowest possible price which will allow the operator a profit. The dollar airplane ride is profitable in planes carrying two or more passengers. The ride must not be longer than five minutes for profitable operation. Before selling a dollar airplane ride our ticket sellers always endeavor to sell a higher priced ride. We use certain points of interest in addition to the comparative length of rides as a sales argument. There is a decided advantage in flying passengers for one dollar to keep equipment moving and attract onlookers for longer rides. The operation in itself is profitable and attracts larger crowds from which various higher priced rides are obtained. Many times the one-dollar ride is merely the beginning of a series of rides, some of them of course in the higher-price class. Many of our good customers have been attracted to flying by means of the dollar ride.—LESTER J. SIPE, *treasurer, York Flying Service, Inc., York, Pa.*

Need Additional Attraction

DOLLAR airplane rides can be successful if there is a sufficient volume of business—of some other form of attraction such as air circuses or parachute jumping is used to bring people to the field. Estimating six trips to the hour and using ships of seating capacity of not under five passengers, the venture can be made profitable. This would mean that the flight would be of approximately five minutes duration. It is profitable to charge a higher price provided some point of interest can be found. This latter varies according to the location of the field. In other words, a point of distinct interest is very desirable. There is an advantage in keeping the equipment moving for it stirs up greater interest in aviation and does much to attract onlookers for both longer rides and a general interest in the industry.—LEWIS TIERNEY, *president, Pocahontas Flying Service, Inc., Bluefield, W. Va.*

A Business Builder

GIVEN a four-place ship (three fare-paying passengers) and seven five-minute trips per hour at one dollar per passenger per trip you take in $21 and fly 35 minutes; balance of hour is wasted taking passengers in and out of ship. Actual cost per hour is $13 *if flown 40 hours per month.*

The trouble is you cannot under ordinary circumstances haul as many and as quickly as above stated.

I would favor the one dollar five-minute trip as it gets more people and they get others for you.—P. L. MCMULLEN, *Richfield Oil Building, Oakland, Cal.*

An Educational Program

THE one-dollar airplane ride was adopted by us for two reasons. First, the public is reluctant to pay more; second, we viewed it more or less as an educational program. By getting more people in the air we thought it would speed up the arrival of the time when commercial aviation will be profitable. I do not believe it profitable with ships of low seating capacity and present cost of airplanes. It would be far better to charge a higher price to fly over points of interest.—LEE U. EYERLY, *president, Eyerly Aircraft Corporation, Salem, Ore.*

Will Never Make Money

THE one-dollar hop is a last resort to get business and nearly every operator who is doing this type of work realizes he is losing money but must take in something to meet his expenses and to eat. The dollar ride in the New York area is the equivalent of a 50 cent or cheaper ride in other areas. I do not believe that this phase of operations will ever make money, regardless of the type of ship used. The Aeronca would come as near as any job to making a stab at this type of work. The ride does not lie with the type of people that would be attracted with this kind of a ride and I don't believe that you could keep a ship sufficiently busy and the rides of such short duration to ever make it profitable.—S. C. HUFFMAN, *Vernalis-Huffman Flying Service, Cincinnati, Ohio.*

Six-Passenger Plane Needed

THESE opinions are advanced by both present and past scenic operators at Grand Central Air Terminal. Frequently the one-dollar ride is a money-maker, in the long run, it shows only a slight profit. —It never has been permitted at this field to degenerate into a last resort to get business at any price. Locally it has required a six-passenger plane to show a profit. Eight or nine minutes has been found most desirable.

Before the passenger takes off, he is told of a longer ride over a more extended area, and of the names of the locations of well-known places. Again, this information is given by the pilot in the air when it is possible. In a large majority of cases, this plan develops $1.50 flights.—A. DORRIS, *publicity director, Grand Central Air Terminal, Glendale, Cal.*

Economically Questionable

THE one-dollar airplane ride is not a money maker. It is an economically questionable attempt, as a last resort, to get business at any price. Even with the unit price of each ride reduced to so low a level, the volume of business does not increase enough to charge off the overhead expenses of operation and leave any profit whatever. Seating capacities in our ships range from one to three paying passengers, and the dollar ride proves unprofitable in all our ships.

The profitable one-dollar ride in a standard four passenger cabin plane must necessarily be not longer than five minutes. The five-minute ride is too short to be appealing, and thus serves to reduce the number of tickets sold. This rate is figured on the operating gross revenue figure of $20 per hour for a four-place cabin ship and allows about seven five-minute rides in the hour period with the highly conservative figure of two to three minutes taxiing between flights.

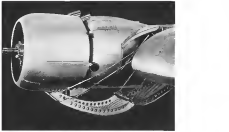
Last summer we carried hundreds of passengers over the warships of the U. S. fleet at anchor at Newport, 20 miles distant, making three trips each hour in four-place cabin planes, at $3 per person.

We have found no advantage in flying passengers for one dollar either to keep equipment moving or to attract onlookers for longer rides. Here, as before, overhead expenses of upkeep overwhelm the questionable advantages of stimulating brief and sporadic flurries of onlooker interest.—C. COZAN, *E. W. Wiggins Inc., Providence, R. I.*

This Month's Question

QUESTION 2: (Submitted by Fred W. Wahl, president, Mountain Airways Corporation, Laramie, Wyo.)

WHAT METHOD of charging for flying time in student instruction have you found to sell best to the student? Is your charge based only on time in the air or have you found it preferable to lower rates and make an additional charge for taxi time?



Retractable servicing platforms are built into the leading edge of the wing of the Martin-130 flying boat

The MAINTENANCE NOTEBOOK

In Cooperation with the Maintenance Committee of the Aeronautical Chamber of Commerce

Martin Maintenance

ELSEWHERE in this issue are illustrated many of the structural features of Martin's new flying boat now undergoing flight tests at Baltimore, the first of three built for Pan American's inter-continental services Of the many maintenance features which have been incorporated in the design, one of the most interesting is the arrangement of retractable servicing platforms built into the leading edge of the wing on both sides of each of the four engine nacelles When extended, the "steps" not only make all parts of the engine section of the nacelle accessible for servicing, but also open up the compartment between the fire wall and the front wing spar (containing the oil tanks, fuel lines, controls, etc) for inspection and repair The oil cooler assembly (see page 12) can also be reached conveniently Readers of this department may recall a somewhat different version of the same idea as worked out by Sikorsky for the S-42 (AVIATION, August, 1934, page 273).

Airwheel Puller

FOR removing Airwheels stuck tightly to hubs after long use, Clarence Belinn in charge of maintenance for National Airways has devised a screw type puller which has taken the trouble out of an ordinarily bothersome job Its construction and method of use are shown in accompanying pictures It can be made up by a good mechanic out of readily available materials

Cylinder Leakage Tester

TO CHECK valve tightness in cylinders after overhaul the engine shop at TWA's Kansas City base has devised a simple test table A hole slightly larger than the outside diameter of the cylinder skirt was cut in the top of a steel work bench A welded-up, tight seamed steel box, deep enough to surround the skirt, was fastened to the underside of the table top, and a compressed air line (with control valve) was flanged into the box Two eccentric type hold-down clamps were bolted to the table top

After valve grinding, one spark plug hole of each cylinder is plugged and a small pressure gage screwed into the other The cylinder skirt is then slipped through the hole in the table the clamps tightened down over the flanges to make an air tight seal through a gasket, and pressure air (100 lb) admitted After the air supply is shut off, by watching the behavior of the pressure indicator, the air tightness of the valves is quickly indicated

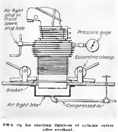
Baggage and Service Cart

J B LaMONT, maintenance superintendent of Northwest Airlines, has contributed a picture of the latest type

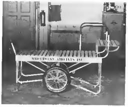
National Airways' Airwheel puller and its application

baggage and servicing cart built in the St Paul shops for distribution to all stations of the system It is light, easily portable, yet obviously built to "take it" A lever actuated toggle arrangement extends the legs on one end, takes the load off the wheels, provides stability when the cart is being used as a servicing platform.

The step on the other end is at the correct height for convenient access to baggage pits, etc., on the flying equipment now in use.



TWA rig for checking tightness of cylinder valves after overhaul.



Northwest's baggage cart.

E.A.L. Engine Storage

OVERHAULED engines in storage awaiting installation may be a bit of a nuisance, particularly if any quantity are on hand Several years ago, Eastern Air worked out a scheme of dummy mounts fastened along the hangar walls on which spare engines were bolted (AVIATION, August, 1931). This eventually proved to be somewhat cumbersome and lacking in flexibility, so a method of handling each engine on its own portable platform was developed The racks are simple and inexpensive, consisting of one wooden and two angle-iron uprights bolted to a square wooden base mounted on four swiveling castors The propeller shaft, covered by a protecting sleeve, rests in a notch in the wooden strut, and the rear of the engine is supported by bolting through the mounting ring to the angle irons Engines come out of overhaul on an overhead trolley system, are dropped onto a cradle, and pushed into storage areas When needed, they are wheeled out onto the hangar floor, lifted off the racks for installation by means of a portable hoist In storage they are protected by tarpaulin and suitably tagged for identification.

E.A L.'s portable cradles offer a convenient and flexible method of engine storage.

Track Checker

A SIMPLE gadget, resembling somewhat an overgrown mechanic's surface gage, was developed in the Atlanta shop of Eastern Air Lines to check the track of propellers mounted on engine shafts It is built of steel tubing, welded The center tube carrying a steel pointer, or "feeler" can be adjusted vertically to suit various propeller tip ground clearances A thumb-screw holds it in place at any desired height The wide tripod base gives adequate stability for use on hangar floor or apron

Checking propeller track with E.A L.'s simple gage.

THE BUYERS' LOG BOOK

AVIATION'S *Card Index of New Equipment*

This department is equipped to help readers locate manufacturers of any parts, accessories or materials

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ENGINE ACCESSORIES — **Flowmeters**

Eclipse Aviation Corporation
East Orange, N. J.

ECLIPSE Direct Reading Flowmeters measure instantaneous rate of flow of fuel in gallons or pounds per hour. Models available for airplane instrument board or engine test stand mounting. Fuel flows upward through tapered tube. Indicating float rises in tube against calibrated scale, depending on rate of flow. Remote Reading (illuminated) model also available.

AVIATION, *January, 1935*

LABORATORY EQUIPMENT — **Rotometer**

Aerial Explorations, Inc.,
Chrysler Building, N. Y. C.

ROTOMETER measures areas of irregular shapes on maps, aerial surveys, photographs, etc. Can be used on uneven surfaces, mosaics, patched maps, rough paper, etc. Working surfaces can be in any position, slanting or vertical. No moving parts, portable, requires no packing or special handling. Special rotometers available for direct readings in any desired unit.

AVIATION, *January, 1935*

MATERIALS — **Metal primer**

Berry Brothers, Inc.,
Detroit, Mich.

BERRYLOID zinc chromate primer (U. S. Navy Spec. P27) has been developed for protecting metal parts of aircraft. Besides its corrosion inhibiting properties, it is quick drying and adheres to all metal surfaces. Dope and lacquer proof. Suitable as an undercoat for lacquer or synthetic enamel finishes. May be applied either by brush or spray. Toluol recommended as a thinner.

AVIATION, *January, 1935*

MATERIALS — **Oil-proof cement**

Thiokol Corporation,
Yardville (Trenton), N. J.

THIOKOL oilproof rubber cement can be used for coating, impregnating, binding and sealing such materials as paper, fabric, felt, cork, etc., to render them impermeable to ordinary solvents. C-1 Cement is a thick dough; C-2 has lower viscosity and may be applied by brushing, spraying or dipping. Both cements are obtainable in 1, 5, and 50-gal containers.

AVIATION, *January, 1935*

RADIO — **Communication receiver**

RCA Victor Company,
Camden, N. J.

RCA model ACR-136, designed primarily for general communications reception in ground stations. Superheterodyne circuit with one tuned r-f stage. No plug-in coils used. Provided with 5-in. built-in loudspeaker plus jack for head phones. Covers 540 to 18,000 kc. in three bands, selection by switch on front of panel. In metal case (22 x 10½ x 11 in.)

AVIATION, *January, 1935*

SHOP EQUIPMENT — **Bolt cutters**

H. K. Porter, Inc.,
Everett, Mass.

THE HKP Swivel Head Cutter, when applied to a standard bolt clipper, makes it possible to work in many locations inaccessible to the fixed head type. A special section joined by ball and socket joint to the cutter-head allows the head to swivel on each side of the handle from 0 to 90 deg. Any standard type of head may be accommodated and changes may readily be made.

AVIATION, *January, 1935*

SHOP EQUIPMENT — **Electric drill**

Skilsaw, Inc.,
Chicago, Ill.

SKILSAW ¼-in. Standard Drill has universal type motor operating on DC or AC, 60 cycle or less (all voltages). Armature statically and dynamically balanced, field and armature windings set in Bakelite, die cast aluminum alloy housing, ball-bearing equipped throughout, heat-treated alloy gears and shafts. Provided with heavy duty three conductor cord with unbreakable rubber connection. Weight 15 lb.

AVIATION, *January, 1935*

SHOP EQUIPMENT — **Welding apparatus (catalogue)**

The Alexander Milburn Company,
1416 West Baltimore St., Baltimore, Md.

THE new 1934-1935 catalogue gives complete description of oxy-acetylene cutting and welding torches, tips, pressure regulators, pressure gages, adaptors and manifolds, paint and lacquer sprays, air and gas purifiers, portable carbide lights, accessories and supplies, with specifications, model numbers and prices. 35 pages, illustrated, paper cover. Available on request.

AVIATION, *January, 1935*

A Lycoming-Smith Controllable Propeller installed on a 1935 Stinson Reliant.

LYCOMING • SMITH

CONTROLLABLE PROPELLERS

Lead in use by Private and Commercial flyers

Only SMITH Has These Important Advantages

The Lycoming-Smith is the only proven Controllable Multi-Pitch Propeller for engines of the 225 H.P. class. Its blades may be changed in the air to flat, steep, or any intermediate setting. While ordinarily only two settings are required, it is a tremendous advantage to be able to select an intermediate setting to gain full advantage of available power for takeoff, sustained climb, and for varying altitudes in flight.

The Smith Propeller is entirely mechanical in operation. It does not depend for its action on electricity or oil from the motor. It may be quickly installed on modern motors without making special or costly changes in the motor.

PROPELLED LYCOMING

Lycoming-Smith Propeller Blades made of Chrome-Vanadium Steel are tougher than ordinary Alloy Blades, and are therefore less subject to nicks and abrasion on the ground and to corrosion or pitting in the air due to the action of the elements.

Because of these important advantages more Lycoming-Smith Controllable Propellers are used by Private and Commercial Operators than any other type of Controllable Propeller. Additional hundreds of Smith Propellers are now on order for Military, Commercial, and Private planes. Repeat orders are the best proof of the deserved and rapidly growing popularity of Lycoming-Smith Propellers.

LYCOMING-SMITH MANUFACTURING COMPANY

Division of Cord Corporation — WILLIAMSPORT, PA. U. S. A.

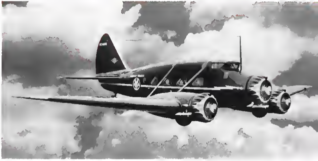
THE STINSON MODEL 'A' AIRLINER* IS THE WORLD'S FASTEST and MOST ECONOMICAL TRIMOTOR

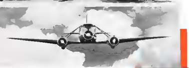
Built for runs where high speed and frequent stops are required, it is necessary to save every precious second possible at stops. With its flaps the Stinson lands in a remarkably short space, may be taxied rapidly, loads passengers and baggage simultaneously, uses Lycoming-Smith Controllable Propellers to take off and climb rapidly. On short hauls the Stinson excels other multimotored planes and is able to "make good" high speeds at the lowest cost per mile ever achieved by modern transport planes.

With express shipments rapidly increasing in volume the Stinson's maximum cargo capacity of 500 pounds in the main baggage compartment and 150 pounds each in both outboard engine nacelles is an important revenue asset.

Wide, deeply tufted reclining chairs, a large lavatory dressing room, main baggage compartment with 500 pound capacity, a commissary for foods, beverages and stewardess supplies, are features of the Stinson Airliner* Cabin. The cabin is 5 feet 9 inches high and 6 feet wide with 11 inch aisles.

Experienced Airline Pilots designed this cockpit and grouped the instruments for easy reading. The cockpit is equipped with every safety device. The indirectly lighted panel, in the center, is fully equipped with dual indication instruments for blind and night flying. Vision forward, to the rear and sides, is unusually good.





Three motors appeal to most Passengers as being safer than two. In 25 million miles of Airline flight, there has never been a fatality in a Stinson Trimotor due to plane or engine failure. No motor of similar power approaches Lycoming's record of 80 million miles of reliable flight. Thus, three proven, non-supercharged Lycoming Motors are obviously more reliable than two supercharged motors with less experience behind them. Note the clean, streamlined, hand-on appearance of the Stinson Model "A". There is no propeller overlap and all propellers are located well ahead of Pilot and Passengers.

Wide windows and wings which are "gulled," permit passengers to see the scenery over which they fly. Heating, sound deadening and ventilation are equal to that of any modern multimotored plane. Four side by side reclining seats for those who wish to ride together, four individual seats for privacy, two position foot rests at each seat, individual reading lights, ash trays, and harmonious styling and comfort are luxury Airliner* features which secure and retain passengers.

Master

OF THE SHORT, HIGH SPEED RUN

Specifications

- Cruises above 160 MPH at low altitudes
- Take-off Run — under 900 feet with full load
- Initial Rate of Climb with full load —1000 feet per minute
- Landing Run, with full load— 600 feet
- Fully loaded will climb above 8000 feet on two engines
- Gas Consumption—42 Gallons per hour.
- Gas Capacity—160 Gallons.
- Useful Load—3080 Pounds
- 8 Comfortable Passenger Seats
- 3 Baggage and Mail Compartments with total allowable capacity of 800 pounds.
- 3 Reliable Lycoming 260 HP Transport Motors
- 3 Lycoming - Smith Controllable Pitch Propellers with chrome-vanadium steel blades
- Landing Flaps—nacelle to nacelle.
- Sperry Horizon and Gyro, Blind Flying Instruments, Landing Lights, Flares, Shielding and Bonding, Airwheels, Hydraulic Vacuum Booster Brakes.

Great Transcontinental Transports, with their supercharged motors now blaze a new speedway through the stratosphere. In their haste to link the Atlantic and Pacific, they have time to stop at only a few of the very largest cities. A wonderful job they are doing, but—

There are scores of cities on the Transcontinental lines, and other scores on the North and South Airlines, which are not now served by modern, high-speed multimotored airplanes. Thus, millions of people, who represent millions of dollars in potential revenue, are clamoring for better mail, express and passenger service.

Why does such a situation exist?

The answer is simple! Until the Stinson Model "A" Trimotored Airliner* was built, operators were unable to buy an airplane which could give short haul, frequent stop, high speed service economically. Other plane manufacturers concentrated on planes for Transcontinental supremacy. Only Stinson foresaw the need for a capable plane to serve these new millions of waiting airline patrons.

The Stinson Airliner*, pictured on these pages, is "Master of the Short, High Speed Run," and bows to no other modern Transport in "Speed made Good" over such routes.

We predict that 1935 will see scores of Stinson Airliners* giving modern airplane service to now neglected Cities, and producing much needed new revenue for wise Airline Operators.

Prices will be furnished on request to interested operators and business executives.

> The Stinson Airliner is also available for the Executive who desires to travel swiftly and comfortably with all the dignity and convenience of his office about him, and for the Hostess who wishes to entertain her guests in a setting comparable to the best interior standards set by fine yacht design.

* The word "AIRLINER" is a part of the REGISTERED TRADEMARK which appears on the fin of every Trimotored Plane built by the Stinson Aircraft Corporation.

STINSON AIRCRAFT CORP. • Wayne, Mich., U. S. A. WORLD'S LARGEST BUILDER OF CABIN PLANES

Division of Cord Corporation

Sixteen Airlines, the U. S. Army, Navy, Coast Guard and more than 600 private and Commercial Airplane Owners, have flown Lycoming Motors more than 80,000,000 miles since 1930.

SINCE 1930 *Lycoming* HAS PRODUCED THE MOST RELIABLE MOTOR IN ITS CLASS!

POWERED BY LYCOMING

THE Lycoming Motor is the only radial air cooled engine, of its power class, which has been thoroughly proven in tens of millions of miles of Airline flying.

The Lycoming Motor is available to Private Flyers, Commercial and Airline Operators, and the Military Services, at no increase in first cost as compared to other engines, and with the assurance of greater reliability and lower operating costs.

LYCOMING MANUFACTURING COMPANY

Division of Cord Corporation WILLIAMSPORT, PA U. S. A.

America's Largest Air Liner

THE MARTIN CLIPPER SHIP

Flies With SKF Bearings

● SKF makes practically *all types of anti-friction bearings* When SKF recommends a particular type of bearing, therefore, you may depend upon it; its recommendations are *unbiased!*

Martin Clipper powered by SKF-Equipped Pratt & Whitney Engines

A rocket of power from horizon to horizon ... this Martin Model 130 Clipper Ship, powered by four Pratt & Whitney engines, attracts the eyes of the world. It carries 50 passengers, a crew of six and two tons of mail and express, smoothly ... safely ... certainly.

But what of the bearings in the 800 h.p. engine that demands *performance* at 2,400 r.p.m. with a propeller gear ratio of 3:2 ... where ability to link speed with load-carrying capacity and dependability mean safety? What of the bearings on the control pulleys that carry heavy cable loads without binding? They're of the same old time-tried make the world knows as SKF.

So America's biggest air-transport is equipped with the world's finest bearings ... and adds another name to the SKF list of *great* applications. For men who plan and build the things that fly consider only one thing when they get up where wing-tips brush cloud-tips ... *performance*. SKF INDUSTRIES, INC., Front St. & Erie Ave., Philadelphia, Pennsylvania.

SKF
BALL AND ROLLER BEARINGS 3373

IT MAY NOT HAPPEN

once in a million miles of transport flying,

BUT...

LET'S look at a few facts that any veteran pilot knows about winter flying.

It's a lot safer than it used to be. We can all grant that.

BUT—sudden blizzards *can* blanket landing fields with snow while your ship's in the air—sudden thaws *can* turn frozen fields soft and muddy between sun up and sun down—bad weather *can* shut down over an area so big that you can't get over or around it.

So what?

Just this—if you ever *do* have to set a ship down on snow—or mud—or a sandy beach—or maybe a plowed field—you can be mighty thankful if that landing is made with Airwheel* equipment.

Airwheel equipment means two important things:

First—tires so big and soft that they spread out and give a safe footing under landing conditions where planes with other types of tires would sink down and nose over.

Second—smooth action—non-fading—sure-releasing hydraulic brakes designed exclusively for airplane use—brakes that will "stop on a dime" when you have to!

We've told this story a good many times—but if you're still one of the dwindling minority who haven't done anything about it, we'd like to suggest you sit down now and write for the records and facts that back up what we've said here. Just write Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California.

* IF IT ISN'T A GOODYEAR IT ISN'T AN AIRWHEEL! AIRWHEEL is Goodyear's trade mark, registered in the U. S. A. and throughout the world, and is used to denote that Goodyear is the exclusive maker of AIRWHEEL Tires

WHEN YOU BUY A NEW SHIP SPECIFY THE GOODYEAR AIRWHEEL AND THE NEW GOODYEAR HYDRAULIC AIRWHEEL BRAKES

Indicates difference in engine speeds within one revolution

Applicable at any engine speed

Operates direct from airplane battery

Independent of Tachometer installation

A mechanical device — requires no calibration

Installation simple — maintenance negligible

Makes perfect synchronization quick and easy

WESTON ELECTRICAL INSTRUMENT CORPORATION, 616 Frelinghuysen Ave., Newark, N. J.

WESTON Instruments

AIR TEMPERATURE INDICATORS • OIL TEMPERATURE INDICATORS • CARBURETOR AIR TEMPERATURE INDICATORS
BLIND LANDING INDICATORS • ENGINE TEMPERATURE INDICATORS • ELECTRIC TACHOMETERS • AMMETERS • VOLTMETERS

Hamilton Standard Controllable Pitch Propellers Contribute to the Success of "Flying Clipper Ship No. 7"

TO THE "FLYING CLIPPER NO. 7" goes the honor of being the world's largest transport. And to Hamilton Standard Controllables goes the distinction of being selected for use on this 48-passenger flying boat. This all-metal, high-wing monoplane was designed and built by the Glenn L. Martin Company from specifications developed by staff engineers of Pan American Airways for service on the lines of this company. Four three-bladed Hamilton Standard Controllables contribute to the high performance of this new transport. When serving as combined passenger and mail plane, this ship will have a cruising range of some 3,000 miles—sufficient to take in its stride the longest over-water leg of any projected route across either the Atlantic or Pacific.

HAMILTON STANDARD PROPELLER COMPANY

EAST HARTFORD • CONNECTICUT

SUBSIDIARY OF UNITED AIRCRAFT CORPORATION

FLIGHTEX

GUARANTEED **FABRIC** GRADE "A"

CONSISTENTLY

first choice of the Aircraft Industry for LIGHT WEIGHT . . . SMOOTHEST FINISH and GREATEST DURABILITY in Service

FLIGHTEX stands out today as a product that has continually and progressively met the needs of a fast-growing industry. It is made by workers who have specialized since 1926 in the manufacture of this high quality specification Grade A Fabric. It has won its place as the almost unanimous choice of aircraft manufacturer, operator and distributor alike on an unmatched record of service under every known flying condition.

FLIGHTEX has all of the important characteristics which contribute so substantially to modern aircraft manufacture and performance. It is lighter in weight, closely woven and much smoother in finish. Less dope is required and sanding costs are reduced to a minimum. Finished surfaces maintain even tautness and have proved more durable under all conditions of service. Hence plane maintenance is always gratifyingly low.

FLIGHTEX is laboratory tested throughout manufacture to conform to highest commercial and Government standards. Suncook Mills are the largest producers of Grade A Fabric for Army and Navy use. Constant research seeks out every opportunity for improvement to meet advances in aircraft design and construction. As a natural result **FLIGHTEX** can always be depended upon to meet current Grade A Fabric specifications exactly, and to incorporate the requirements of possible future changes as soon as they are made.

SUNCOOK MILLS
34 THOMAS STREET, NEW YORK CITY

FLIGHTEX FABRIC
REGISTERED U.S. PAT. OFF.

FLYING FINISHES

Only the surest workmanship only the finest materials . aviation's never ceasing demand Sherwin Williams finishes for the aviation industry are formulated to meet every stringent requirement They have flown millions of miles and have stood up in a fashion befitting the organization and research behind them Not only finishes but the paint engineering service that Sherwin-Williams offers the aviation industry is of the same superior type Be sure to see that the Sherwin-Williams paint engineer helps you to establish lower costs through the use of the best finishes obtainable

SHERWIN-WILLIAMS

Industrial Finishes

Fabric Finishes . Metal Finishes Wood Finishes . Dopes Thinners Primers Lacquers . Enamels . Your finishing problems can be or already have been solved by Sherwin-Williams paint engineers They are interested in your costs, your quality and in furnishing the finishes that will be the best for both

See the Sherwin-Williams Paint Engineer

COVER THE EARTH

SHERWIN-WILLIAMS PAINTS
INDUSTRIAL FINISHES

SHERWIN-WILLIAMS PAINTS

HIRAM WALKER

PEORIA, ILL.

All structural steel and iron work at the world's largest distillery, Hiram Walker's at Peoria, Ill., is protected with Sherwin-Williams Kromik Metal Primer and with Metalastic Field Coat. It's a huge job—it *must* be, to thoroughly protect a plant of such proportions. It covers 22 acres of ground, has a daily capacity of 100,000 gallons and a bottling capacity of 10,000 cases of quarts every 7-hour day. Much of the painting had to be carried on during adverse winter weather conditions, but thanks to the good paint and good painting (Val Johst and Son were the contractors), an outstanding job was done. Some four thousand tons of structural steel, as well as 2,000 tons of plate employed in tank construction, were given a prime and finish coat. Both Hiram Walker and Sherwin-Williams are proud of the job.

FREE BOOKS

Check the Sherwin-Williams painting booklets most interesting to you. They will be promptly forwarded.

1 Plant Interiors
2 Plant Exteriors
3 Metal Protection
4 Product Finishing—Metal.
5 Product Finishing—Wood
6 Bus Finishing
7 Truck Finishing
8 Aluminum Paint

Name..........................

Company.......................

Position.......................

Address........................

PHILCO

PHILADELPHIA, PA.

A visit to the Philco Radio and Television Company's plant in Philadelphia is a visit to a beehive. Production is at higher levels than ever before. In the cabinet plant Sherwin-Williams lacquers are part and parcel of this beehive activity. Fillers, first coats, second coats, and soft transparent finishing lacquers are part of the preparation of the finished Philco that may grace your home. You would be amazed at the hand finishing that goes into each cabinet—amazed also at the speed and dispatch with which cabinets are turned out.

BETTER LIGHT BETTER SIGHT

NEW YORK CITY

On the authority of the Better Vision Institute, 85% of all we know comes to us through eyes. Our working and living depend upon them. How to aid them to the fullest? With light, enough light. How to get enough light? See that daylight and artificial light are reflected to the fullest extent. How to do this? As Beechnut Packing, Kendall Mills, Breyer's Ice Cream and other industrial leaders do it . . . by seeing that wall and ceiling surfaces are painted with Save-Lite Mill White.

SAVE-LITE

SAVE SIGHT

"Specially formulated for your industry." These five words cover a wealth of experience, research and production. You may have a fume resisting problem, a dust retention problem. You may need a paint that is heat resistant. In your industry a washable gloss may be vital, in someone else's an egg-shell combination of the properties of gloss and flat wall paints is equally necessary. Perhaps you don't know the proper paint for your application. The five words mentioned cover all of the years of The Sherwin-Williams Company's efforts on all paint problems. Breadth of experience means specific answers to your individual problems.

RAFTER

BELLEVILLE, N. J.

Saving light and sight with another Sherwin-Williams Save-Lite job. Rafter Machine Co., Belleville, N. J.

ANSWERS

1 White paint has the highest light reflection value—much higher than aluminum.

2 White paint also has a higher heat reflection value than any other. This means vital saving in gallonage losses of volatile liquids exposed to the sun's rays or other high heat sources.

3 The Mauretania, crack English liner, made heat tests on two Caribbean cruises. When the hull was painted white, the ship was ten degrees cooler than under ordinary dark colors.

4 Westinghouse Electric and Procter and Gamble put all maintenance painting on a time-study and production basis. The savings ran into thousands of dollars yearly.

5 Watch color. It is going to be used to an ever increasing extent in painting.

6 Be sure to know how to prepare a surface for paint as well as how to paint it. Sherwin-Williams paint engineers will give you good counsel in this regard.

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All Hazard Aircraft Cable is manufactured to rigid U. S. Army and Navy specifications and it is also approved by the Navy Bureau of Aeronautics and the Department of Commerce.

We shall be glad to place our Engineering Department at the service of aircraft designers and manufacturers, or to furnish booklets and technical data covering all types of Hazard Cable for aircraft, marine, and general industrial purposes. Write us.

The following sizes and quantities of Hazard Aircraft Cable were used to equip Clipper No. 7:

1/16 in.	700 ft.
3/32 in.	1250 ft.
1/8 in.	200 ft.
5/32 in.	347 ft.
3/16 in.	1634 ft.
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HAZARD STAINLESS STEEL AIRCRAFT CABLE was used as follows:

3/16 in.	125 ft.
1/4 in.	625 ft.
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Business Men's PROSPERITY SURVEY

HERE'S a chance to give voice to your own ideas as to which national policies you believe most likely to speed recovery in your line of business.

BALLOTS like this are being published this month in many business papers affiliated with The Associated Business Papers, Inc.—reaching virtually all key men in every line of industry, trade and profession throughout the nation.

BUSINESS men, nationally, may appreciate an opportunity to express their convictions to a strictly non-partisan and impartial body—with the assurance that by so doing, business views will be presented effectively to the political, banking, industrial, business and labor leaders of the country.

QUESTIONS on the economic ballot below are prefaced with "In your line of business" to make possible an industry by industry study as well as a consensus of business opinion in all fields of industry—so let our industry be well represented in the responses.

ECONOMIC BALLOT

Check your convictions, sign, clip and mail this ballot.

1 As regards the possibility of Congress adopting a universal thirty-hour work week, do you favor such legislation? Yes ( ) No ( ); and if so on the basis of ( ) continuation of existing weekly wages, or ( ) continuation of existing hourly rates of pay

2 In your line of business are you satisfied with enforcement of maximum hours and minimum wage provisions now in effect? Yes ( ) No ( )

3 In your line of business is there obtainable ample working capital—from banks? Yes ( ) No ( ); from government agencies? Yes ( ) No ( )

4 In your line of business is there obtainable ample investment capital—from banks? Yes ( ) No ( ); from government agencies? Yes ( ) No ( )

5 In your line of business do you favor limitation of industrial output—by government control? Yes ( ) No ( ); by industry control? Yes ( ) No ( )

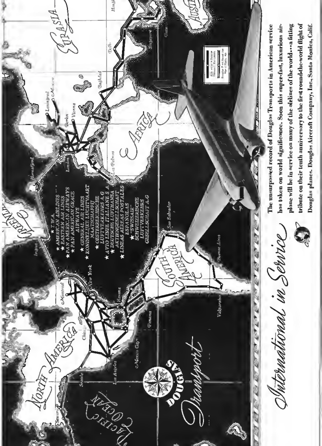
6 In your line of business do you favor a plan for control of prices—by a code provision establishing price fixing? Yes ( ) No ( ), by a code provision establishing an open price plan? Yes ( ) No ( )

7 In your line of business do you think that government measures now in effect are helping small and medium sized enterprises? Yes ( ) No ( ), hurting such enterprises? Yes ( ) No ( )

Sign or not as you please

Kind of Business

Please return this ballot to: Aviation c/o The Associated Business Papers, Inc. 330 West 42nd St., New York, N. Y.



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—determine float and hull forms, including float steps, forward and after underwater body, decks and sides, wing tip float forms, float dimensions, float drag, etc
—obtain water stability of floats
—conduct model basin tests of floats and hulls
—compute take off figures
—find structural loads
—subdivide floats and hulls
—figure gross weight and useful loads
—design framing, bulkheads, shell plating, etc
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OX-5 $10.95 Velie LeBlonds $16.75 Szekeley Continental $13.95 Fords Chevrolets $9.95 Air Wheels 7.00-4 ml $14.00 including tube Hibbs Ft Worth Texas

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WANTED To trade Challenger Commandaire in perfect condition Licensed For a four-place cabin job Preference Stinson or Waco Would consider purchasing outright at a sacrifice Write what you have Address P O Box 874 Rocky Mount N C

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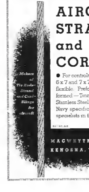

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INDEX TO ADVERTISERS

Regular Pilot Albert Ball (United Air Lines) gives his views of training schools

"Since I graduated from Boeing..."

"I've seen too many men with a pretty diploma trying to land jobs that required a background they just didn't have," wrote Albert Ball to a younger friend recently. "My advice to you is choose a conservative school like Boeing—where, besides flying, they give you plenty of hours of 'practical' and 'theoretical.'"

We reproduce this comment because it expresses so aptly the viewpoints of United Air Lines and of Boeing School itself. Any Boeing graduate will agree that the courses here are much more comprehensive than those usually offered.

For example, the Boeing Airline Pilot and Operations course comprises 4015 hours of solid work. Lecture and shop, apprentice work, airline operations, dual and solo flying in 11 different types of planes ... a concentration of experience few men in the industry get even from a lifetime of practical work.

If you are willing to grind in order to attain a worthwhile career in aviation, write today for further information about Boeing School and enrollment requirements. Rates from $700.00 upwards; courses from nine months to two years. Mail coupon today.

Boeing School of Aeronautics
Division of United Air Lines

How to decide on your Aviation School

W D Williams, Pilot Midwest Division, United Air Lines, lists 7 vital points to investigate:

- Has it a "playboy flying school" reputation—or is it known for its hard work?
- What equipment will I actually work with—in planes, laboratories, shops?
- Who are the men I will actually study under?
- Has school advantage of direct association with a large airline?
- What are its graduates doing?
- How does the U S Govt rate it?
- Are students lured by promises of jobs or are they attracted by the school's superior training?

NEXT REGULAR ENROLLMENT APRIL 1

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☐ Private Pilot
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☐ Airline Operations
☐ Airline Technician (Open to Engineering graduates)
☐ Airline Pilot and Operations
☐ Special Airline Pilot (For Transport Pilots only)
☐ Amateur Pilot

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Years in High School Years in College
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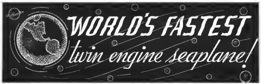
City State



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BELLANCA

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Nov 30th 1934

Mr Richard Goldsmith,
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